SELECTED WATER RESOURCES ABSTRACTS

VOLUME 4, NUMBER 22
NOVEMBER 15, 1971

UNIVERSITY OF KENTUCKY
WATER RESOURCES INSTITUTE
LEXINGTON, KENTUCKY

W71-11643 -- W71-12244

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WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

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Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency, Water Quality Office. A directory of the Centers appears on inside back cover.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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01 NATURE OF WATER
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02 WATER CYCLE
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

SEA ICE AND SUPERCOOLED WATER,
Department of Energy, Mines and Resources, Victoria (British Columbia). Frozen Sea Research Group.
For primary bibliographic entry see Field 02C.
W71-11741

02. WATER CYCLE

2A. General

DIRECTORY OF HYDRAULIC RESEARCH INSTITUTES AND LABORATORIES.
International Association for Hydraulic Research, Delft (Netherlands).

Available from IAHR, P. O. Box 177, Raam 61, Delft, Netherlands - Price: $15.00. International Association for Hydraulic Research (IAHR) Directory, Part 1 and 2, April 1971.

Descriptors: *Hydraulics, *Hydrodynamics, *Research facilities, *Laboratories, Hydraulic engineering, Hydrology, Institutions, Personnel, Project planning, Inter-agency cooperation, Research and development, Technical societies.
Identifiers: *Research facilities directory, *Hydraulic research, International association.

To provide information about the facilities and capabilities of hydraulic research organizations throughout the world and about the general scope of activities of each organization, this new and broader directory has been compiled. It replaces the biennial Bulletin of Hydraulic Research, the last of which was volume 20, 1969. The trends of research emphasis are indicated by the list of facilities and activities in 38 nations and in 30 states of the USA. The format provides the official name and address of the facility, name of the institute director and number of personnel on his staff, and gives information on financing, scope of activities, method of solving problems, computer facilities, publications (outlet and availability), and the field in which research is carried on under the IAHR technical committees. This directory is useful to all those engaged in hydraulics, hydrodynamics and hydrology. (Lang-USGS)
W71-12018

PALEOECOLOGY OF SHELL MOUNDS AT OTUMA, PERU,
Florida Atlantic Univ., Boca Raton; and Rutgers-The State Univ., New Brunswick, N.J. Dept. of Geography and Geology.
For primary bibliographic entry see Field 06G.
W71-12108

MAN'S PERPETUAL QUEST FOR WATER,
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 06E.
W71-12124

GENESIS OF 'MITHA RANNS', 'KHARIA RANN', AND 'KANODWALA RANNS' IN THE GREAT INDIAN DESERT,
Central Arid Zone Research Inst., Jodhpur (India).
S. Pandey, and P. C. Chatterji.
Annals of Arid Zone, Vol 9, No 3, September 1970, p 175-180. 2 maps, 2 ref.

Descriptors: *Geohydrologic units, *Playas, *Evaporation, *Geology, *Surface-groundwater relationships, Deserts, Arid lands, Sinks, Watersheds (Basins), Foreign countries.
Identifiers: *India.

Saline depressions in the Indian Desert gather groundwater and concentrate natural evaporites. They are found in the extremely arid zone of Rajasthan, where the rainfall is sparse and erratic. These depressions, or ranns, are underlain by Jurassic and Cretaceous sandstones and limestones, as well as by Quaternary clays and recent blown sands. The ranns are individual basins separated by uplands, but few streams drain into them. The ranns appear to follow fault zones closely, as a map illustrates. (Yensen-Arizona)
W71-12140

2B. Precipitation

FOURIER ANALYSIS OF WEATHER AND WAVE DATA FROM HOLLAND, MICHIGAN, JULY 1970,
Williams Coll., Williamstown, Mass.; and Western Michigan Univ., Kalamazoo.
For primary bibliographic entry see Field 02H.
W71-11775

A HURRICANE MODEL FOR SIMULATING CLOUD SEEDING,
Miami Univ, Coral Gables, Fla. Rosenstiel School of Marine and Atmospheric Science.
M. A. Estoque.
NTIS No. COM 71-00615, Springfield, Va. 22151. $3.00 printed copy, $0.95 in microfiche. Miami University, Rosenstiel School of Marine and Atmospheric Science, Final Report, February 1971. 36 p, 20 fig, 1 tab, 6 ref. NOAA E-22-47-68 (G).

Descriptors: *Cloud seeding, *Hurricanes, *Model studies, *Florida, *Artificial precipitation, Theoretical analysis, Analytical techniques, Rainfall.
Identifiers: *Cloud seeding simulation.

A theoretical model for studying the effects of artificial cloud seeding on hurricanes is described. The model is based on the time-dependent, nonlinear, and axially symmetric primitive equations. The effects of cloud microphysical processes and the distribution of water in clouds and in precipitation are determined. Artificial seeding is simulated in the model by freezing a specified percentage of the total liquid water content and then releasing the heat of fusion. Seeding the hurricane eyewall produces appreciable perturbations (gravity wave type) in the pressure and the wind fields. The amplitudes of these perturbations are comparable to the amplitudes of perturbations which occur in the unseeded hurricane. Seeding produces an intensification of the storm in the earlier stages; but, subsequently, the seeded hurricane becomes weaker than the unseeded one. (Woodard-USGS)
W71-11991

THE DECISION PROCESS IN HURRICANE FORECASTING,
National Oceanic and Atmospheric Administration, Miami Fla., National Hurricane Center.
R. H. Simpson.
Available as COM 71-00336 from National Technical Information Service, Springfield, Va. 22151 - price $3.00 printed copy, $0.95 in microfiche. National Oceanic and Atmospheric Administration Technical Memorandum NWS TM SR-53, January 1971. 35 p, 16 fig, 1 tab, 32 ref.

Descriptors: *Hurricanes, *Rain, *Weather forecasting, Floods, Runoff, Winds, Clouds, Storms, Vortices, Climatology, Meteorology, Remote sensing, Radar, Tracking techniques.
Identifiers: *Hurricane forecasting, *Hurricane tracking.

The procedures and decision ladders for each phase of a hurricane forecast are described, including the positioning of the center, the development of a disturbance, growth of a vortex, and movement of the center. An index to the wetness or the potential for heavy rains in a hurricane is presented from meteorological satellite pictures of the storm core. Where many spiral rainbands of penetrative convection contribute to an exceedingly bright core near the center very heavy rainfall rates are observed. These rainfall rates can be more precisely verified when the storm comes within range of land based radar. The problem which the forecaster faces is not simply the estimate of total rainfall accumulation at a single spot, but rather the areal potential for a flash flood which may develop if the soil is already saturated or if the storm moves inland in a mountainous or hilly area, or if the vortex stalls under circumstances which permit it to continue depositing heavy rains for many hours after winds have decayed to less than gale force. (Woodard-USGS)
W71-11995

THE WATER BALANCE OF LAKE VICTORIA: TECHNICAL NOTE,
Ministry of Mineral and Water Resources, Entebbe (Uganda). Dept. of Water Development.
For primary bibliographic entry see Field 02H.
W71-11998

FREQUENCY OF DUSTSTORMS AT BE'ER SHEVA',
Israel Meteorological Service, Bet Dagan.
J. Katsnelson.
Israel Journal of Earth-Sciences, Vol. 19, No. 2, p. 69-76, 1970. 5 fig, 2 tab, 5 ref.

Descriptors: *Dust storms, *Arid lands, *Climatic data, *Fronts (Atmospheric), *Winds, Sands, Loess, Wind velocity, Seasonal, Environmental effects, Temperature, Rainfall.
Identifiers: *Israel, *Negev Desert, *Wind direction.

A sand or dust storm occurs if the visibility is reduced to less than 1 km while the particles are being raised to great heights by strong and turbulent winds. Such storms occur mainly in desert regions and the necessary conditions for their occurrence are existing areas of loose sand, dust or loess, relatively strong winds, a steep temperature lapse rate in the lower atmosphere layers, and a preceding dry spell. Rainfall usually causes their cessation. All dust storms recorded at the meteorological station at Beersheva over a 12-year period (1958-1969) were analyzed in terms of wind direction, wind velocity and time of year. There were 88 storms in which visibility was 5 km or less (recorded for aviation purposes) and 39 storms of 1 km or less visibility. Contrary to previous opinion, it was found that 60% of all storms having either kind of visibility come from SW-NW. Apparently after the passage of a cold, dry front, the wind veers and becomes W-NW with decreasing velocity, but is still strong enough to transport to Beersheva part of the dust from SW to NW of the area and to return part of the dust in the air of W-NW sector. (Casey-Arizona)
W71-12096

THE SYNOPTICS OF HAIL IN ISRAEL,
Israel Meteorological Service, Bet Dagan. Div. of Synoptic Meteorology.
M. Levi.
Israel Journal of Earth-Sciences, Vol. 19, No. 2, p 77-83, 1970. 8 fig, 3 tab, 8 ref.

Descriptors: *Hail, *Synoptic analysis, *Radiosondes, *Meteorological data, *Thunderstorms, Mapping, Fronts (Atmospheric), Isotherms, Advection, Air temperature, Water vapor, Clouds, Winds.
Identifiers: *Israel, *Tropopause.

In Israel, hail occurs mostly in winter, and as a rule is connected with cold lows and their attendant cold fronts. It depends on the development of large vertical clouds with certain areas containing their own horizontal wind and up-currents. This development interacts with local climatic variables making hail fall prediction, both spatial and temporal, difficult. Because of it's potential destruc-

tiveness, particularly in agriculture, synoptic analyses are important. Using surface and upper level maps and radiosondes, several synoptic situations are described and analyzed. The most promising indicators in hail fall predictions appear to be an empirically derived tropopause height threshold value and the presence and direction of local jet-streams. Other possibilities are the combination of the thickness value of 1000/500 mb together with the temperature difference 850/500 mb and the combination of the height of the 0 deg isotherm and the temperature at 500 mb. (Casey-Arizona)
W71-12097

THE SEASONAL INCIDENCE OF RAINFALL,
University Coll., London (England). Dept. of Geography.
J. O. Ayoade.
Weather, Vol. 25, No. 9, p. 414-418, September 1970. 3 fig, 5 ref.

Descriptors: *Seasonal, *Climatic data, *Rainfall disposition, *Subhumid regions, *Estimating equations, Runoff, Tropical regions.
Identifiers: *Nigeria, *Seasonality index.

In the subhumid tropics, rainfall is variable both spatially and temporally. The necessity of knowing both mean rainfall conditions and their variability is made more difficulty by the pronounced seasonality of tropical rainfall. Mapping techniques such as monthly rainfall histograms, isomers and pluviometric coefficients all suffer from the major defect of not providing a single measure of seasonality for a station. Other methods, such as mapping rainy season duration, fail to distinguish adequately the intensity and severity of seasonality. A simple index was derived by adding the absolute deviations of the mean rainfall for each month of the year from the expected monthly value if the annual rainfall were uniformly distributed throughout the year. The result, the seasonality index (SI), is expressed as a percentage of the maximum possible deviation. Maps of SI, mean annual rainfall and rainy season duration for Nigeria are presented and discussed. While it does not take into account the ordering of the wet months, the SI does provide a single figure for each station incorporating all yearly rainfall variations. (Casey-Arizona)
W71-12099

GLOBAL DISTRIBUTION OF NET RADIATION ACCORDING TO A NEW FORMULA,
Hawaii Univ., Honolulu. Water Resources Research Center.
Jen-Hu Chang.
Annals, Association of American Geographers, Vol 60, No 2, p 340-351, June 1970. 7 fig, 1 tab, 45 ref. ESSA Grant E-44-67 (G).

Descriptors: *Solar radiation, *Estimating equations, *Climatic data, *Mapping, *Water vapor, Clouds, Albedo, Latitudinal studies, Correlation analysis, Temperature, Energy budget.
Identifiers: *Net radiation, *Radiometers, *Reflection coefficients.

Net radiation, the difference between the downward and upward radiative fluxes, gives a measure of the rate of heating in the lower atmosphere and ground surface, which has important connotations in energy and moisture budgets. Since actual measurements have been rare, this important climatic variable has been calculated by empirical equations using cloudiness, air temperature and humidity data. Unfortunately, the use of cloudiness introduces a major error due to cloud variations. Using an empirical linear relationship between solar radiation and net radiation, a new formula was derived using solar radiation instead of cloudiness. The constants were evaluated by using 125-month net radiation records from 5 weather stations around the world. Although the formula has certain limitations, such as the use of surface vapor pressure instead of total precipitable water, when the computed values according to the new formula were plotted against observed net radiation values, a correlation coefficient of 0.97 was obtained, with a standard estimate error of 2.57 langleys/day. Using the new formula as applied to 386 stations throughout the world, with selected reflection coefficients, net radiation maps were constructed for the mid-season months, January, April, July and October and for the year. Mean values of net radiation were computed from the maps for all continents and were shown to be consistently higher than those calculated from Budyko's formula. (Casey-Arizona)
W71-12112

2C. Snow, Ice, and Frost

SEA ICE AND SUPERCOOLED WATER,
Department of Energy, Mines and Resources, Victoria (British Columbia). Frozen Sea Research Group.
E. L. Lewis, and R. A. Lake.
Journal of Geophysical Research, Vol 76, No 24, p 5836-5841, August 20, 1971. 2 fig, 22 ref.

Descriptors: *Freezing, *Sea ice, *Supercooling, Crystallization, Water temperature, Sea water, Crystal growth chemistry, Salinity, Oceanography.
Identifiers: Freezing (Sea water).

The existence of supercooled water below growing sea ice has been postulated in the past to explain anomalous temperature and salinity values in the water column. In addition supercooling has been invoked to explain ice-crystal production in the water that is tens of meters below the ice sheet and on the sea bed near the shore. From a study of the literature and the laboratory experiments it is concluded that the postulate is unnecessary and that supercooling of the water mass, if it exists at all, is transitory. (Knapp-USGS)
W71-11741

A NEW ICE ROD (GR-85) (Novaya shugomernaya reyka GR-85),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 07B.
W71-11768

ICE EQUIPMENT FOR HYDROMETRIC STUDIES FROM ICE COVER (Kompleks prisposobleniy dlya zimnikh gidrometricheskikh rabot s podvesnoy shtangi s poverkhnosti ledyanogo pokrova (PI-15)),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 07B.
W71-11769

THE MARCH-APRIL 1969 SNOWMELT FLOODS IN THE RED RIVER OF THE NORTH, UPPER MISSISSIPPI, AND MISSOURI BASINS,
For primary bibliographic entry see Field 02E.
W71-11996

EVALUATION OF SOUTH CASCADE GLACIER TEST SITE RESULTS,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 07B.
W71-12000

RADAR SCATTEROMETER MEASUREMENTS OF SEA ICE,
Kansas Univ., Lawrence. Remote Sensing Lab.
For primary bibliographic entry see Field 07B.
W71-12011

CALCULATING THE STRENGTH OF A MELTING ICE COVER AND THE EFFECT OF WIND ON ICE DRIFT (Raschet prochnosti tayushchego ledyanogo pokrova i nachala vetrovogo dreyfa l'da),
Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr SSSR, Leningrad.
S. N. Bulatov.
Leningrad, Gidrometeorologicheskiy Nauchno-Issledovatel'skiy Tsentr SSSR Trudy, No 74, 1970. 120 p.

Descriptors: *Ice, *Winds, *Mechanical properties, *Strength, *Melting, Stress analysis, Strength of materials, Lake ice, Solar radiation, Albedo, Water temperature, Fresh water, Melt water, Heat flow, Reservoirs, Rivers, Wind velocity, Porosity, Elasticity (Mechanical), Ice breakup.
Identifiers: *USSR, *Ice drift, *Ice physics, Ice cover, Ice thickness, Fresh-water ice, Ice structure, River ice, Modulus of elasticity.

Melting and reduction of strength of the ice covers of rivers and reservoirs were examined as part of the development of a method for calculating the thickness and strength of a melting ice cover. The method is based on the modulus of elasticity, time, and unit load applied at an ice temperature of minus 10C. To study the change in the strength of ice during melting, the structure of the ice of rivers and reservoirs was compared with that of sea ice. The effects of solar radiation and meteorological factors on the structural and strength characteristics of melting ice were also studied. The concluding section is devoted to a calculation of the effect of wind on ice drift on reservoirs. Actual and predicted dates for the beginning of ice flow are given for two reservoirs of the USSR--the Bratsk Reservoir (Irkutsk Oblast) and the Novosibirsk Reservoir (Novosibirsk Oblast). (Josefson-USGS)
W71-12020

ICE STUDIES (Ledovyye issledovaniya).
State Hydrological Inst., Leningrad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut. Trudy, No 184, 1971. 136 p.

Descriptors: *Ice, *Snow, *Mechanical properties, *Physical properties, *Ice loads, Snow cover, Discharge coefficients, Lake ice, Ice breakup, Iced lakes, Ice jams, Seasonal, Streamflow forecasting, Model studies, Loads (Forces), Stress analysis, Strain measurement, Instrumentation, Hydraulics, Rheology.
Identifiers: *USSR, *Ice physics, Ice cover, Ice drift, Ice melt, Ice regime, Snow ice, Drift ice, Kinematics, Bending.

This collection of seven papers is a summary review of theoretical, laboratory and field studies of ice phenomena. Methods and techniques are suggested for determining a number of physical parameters of ice, including various mechanical, geometric, and thermal properties. The principal subjects covered in the monograph include the rheological nature of ice, strength measurements of an ice cover, ice melt, and a general description of the formation of snow ice. (See also W71-12022 thru W71-12028) (Josefson-USGS)
W71-12021

ELECTRIC MODEL OF THE STRESS STATE OF A VERY VISCOUS SLAB (Elektricheskaya model' napryazhennogo sostoyaniya ochen' vyazkoy plity),
State Hydrological Inst. Leningrad (USSR).
B. V. Proskuryakov.
In: Ledovyye issledovaniya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 184, p 130-133, 1971. 4 p.

Descriptors: *Model studies, *Ice, *Stress analysis, *Loads (Forces), Mechanical properties, Hydraulic models, Stress, Viscosity, Flow, Winds, Hydrodynamics, Pressure, Deformation, Hydraulics, Equations.
Identifiers: *USSR, *Ice physics, Ice cover, Ice thickness, Aerodynamics.

A knowledge of the stress state of ice cover is important for controlling ice jams, determining areas of possible hummocking, and for describing the forces which ice can exert against hydraulic structures. A method was proposed for studying the stress state of an ice cover subjected to hydrodynamic and aerodynamic loads. A differential equation of the 'viscous movement' of ice exposed to wind and flow was examined and applied to formulating an electric model for reproducing a velocity field for individual points on an ice cover. (See also W71-12021) (Josefson-USGS)
W71-12022

A STUDY OF SNOW ICE (Issledovaniye snezhnogo l'da),
State Hydrological Inst. Leningrad (USSR).
A. G. Deryugin.
In: Ledovyye issledovaniya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 184, p 43-93, 1971. 51 p, 5 fig, 15 tab, 29 ref, 4 append.

Descriptors: *Snow, *Ice, *Mechanical properties, *Physical properties, *Snow cover, Seasonal, Snowfall, Freezing, Thawing, Floods, Capillary action, Capillary fringe, Thermal conductivity, Air temperature, Saturation, Solar radiation, Porosity, Density, Compressive strength, Loads (Forces).
Identifiers: *USSR, *Ice physics, *Snow ice, Lake Krasavitsa, Leningrad Oblast, Ice cover, Ice thickness, Bending.

A general description of the formation of snow ice is given, accompanied by specific examples of its formation on Lake Krasavitsa, Leningrad Oblast. Various aspects of snow-ice formation are discussed. These include: (1) thickness of ice, depth of snow on the ice, and successive stages leading to accretion of snow ice; (2) formation of cracks in the ice as a result of thermal bending of the ice cover; (3) capillary loads exerted on the ice cover during flooding of the snow and ice; (4) extent of freezing in the water-saturated snow; (5) role of capillary forces in the propagation of water in the snow; and (6) the basic physico-mechanical properties of snow ice, including porosity, density, thermal conductivity, heat exchange, absorption coefficient of solar radiation, and compressive and bending strengths. (See also W71-12021) (Josefson-USGS)
W71-12023

TECHNIQUES FOR STUDYING KINEMATICS OF ICE COVER (Metodika izucheniya kinematiki ledyanogo pokrova),
State Hydrologic Inst., Leningrad (USSR).
V. P. Berdennikov, A. G. Deryugin, and N. A. Khaminov.
In: Ledovyye issledovaniya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 184, p 23-42, 1971. 20 p, 7 fig, 4 tab, 5 ref.

Descriptors: *Ice, *Strain gages, *Strain measurement, *Instrumentation, *Deformation, Mechanical properties, Elastic deformation, Loads (Forces), Flow rates, Elasticity (Mechanical), On-site investigations, Foreign research.
Identifiers: *USSR, *Ice physics, Leveling, Tensometry, Tensometers, Sensors, Ice movement, Ice cover, Ice drift, Drift ice.

The observation techniques and instrumentation employed in on-site investigations of the movements and deformations of continuous ice cover and of pack ice are described. Automatic ice-movement measuring stations, developed by the State Hydrologic Institute were used to record the magnitude and direction of ice movement. Ice movement could be recorded at flow rates as low as 0.02 m/sec. In several instances drift ice was observed to move at a rate of 0.6 m/sec or more. Ice cover deformations were determined by two methods: (1) leveling to record deformations which indicated the presence of bending waves in the ice and (2) tensometry to measure deformation using surface, deep, and vertical sensors in temporarily placed (stress-free) and permanently placed installations. The results of tensometric measurements correlate well with leveling data and confirm the assumption of undulatory deformations in ice cover. (See also W71-12021) (Josefson-USGS)
W71-12024

A METHOD FOR DETERMINING STRENGTH OF ICE COVER AND ITS APPLICATION (Metod opredeleniya napryazheniy ledyanogo pokrova i opyt yego primeneniya),
State Hydrological Inst., Leningrad (USSR).
B. V. Proskuryakov, and V. P. Berdennikov.
In: Ledovyye issledovaniya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 184, p 3-22, 1971. 20 p, 8 fig, 5 tab, 3 ref.

Descriptors: *Strength, *Stress, *Ice, *Hydraulics, *Mechanical properties, Strain, Tension, Stress analysis, Viscosity, Deformation, Rheology, Viscous flow, Model studies, Pressure, On-site investigations, Equipment.
Identifiers: *USSR, *Ice physics, Lagrange number, Rheological models.

A method was proposed for determining the flexural strength of ice cover based on a hydromechanical comparison of the deformations of a viscous liquid and of a slit 10-25 m long and 0.3-0.4 m wide made in the ice. A Lagrange number 1.4, determined in the laboratory, was used to relate the strain rate parallel to the slit in the ice to stress. Special devices were developed and tested to measure the strain rate at automatic stress-strain stations designed to transmit data over long distances (up to 50 km). The strain rate of the slit was measured at various points on the ice cover in two distinctly different winter periods. The stress was defined by the Lagrange number, the length of the slit, and by on-site determinations of the viscosity coefficient of the ice. The maximum stress recorded was 20 metric tons/sq m. (See also W71-12021) (Josefson-USGS)
W71-12025

A METHOD OF CALCULATING PRESSURE DURING EXPANSION OF ICE ONTO AN INCLINED PLANE OF AN EMBANKMENT (Skhema rascheta davleniya pri navale ledyanogo polya na naklonnuyu ploskost' naberezhnoy),
State Hydrological Inst., Leningrad (USSR).
B. V. Proskuryakov, and V. P. Berdennikov.
In: Ledovyye issledovaniya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 184, p 120-129, 1971. 10 p, 3 fig, 1 tab, 3 ref.

Descriptors: *Ice, *Ice loads, *Pressure, *Expansion, *Compressive strength, Mechanical properties, Strength, Stress analysis, Strength of materials, Elasticity (Mechanical), Hydraulic structures, Loads (Forces), Equations, On-site investigations.
Identifiers: *USSR, *Ice physics, Bending, Ice thickness.

An ice cover subjected to wind or to a rise in temperature may exert great pressure on beach protective works or other hydraulic structures located along a beach. To calculate horizontal and vertical pressure components of ice during its horizontal expansion onto an inclined plane, two cases of bending phenomena are considered: (1) a case of simple bending due only to a vertical component, such as a change in water level; and (2) a case of complex bending caused by the combined action of compression and bending. To calculate pressure during expansion, the temporary compressive strength of ice must be included as a component force. (See also W71-12021) (Josefson-USGS)
W71-12026

ICE MELT ON THE NEVA RIVER (Stok l'da r. Nevy),
State Hydrological Inst., Leningrad (USSR).
A. G. Deryugin, and V. I. Lazarevskaya.
In: Ledovyye issledovaniya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 184, p 94-105, 1971. 12 p, 3 fig, 4 tab, 5 ref.

Descriptors: *Ice, *Lake ice, *Ice breakup, *Rivers, *Iced lakes, Ice jams, Melting, Freezing, Seasonal, Water levels, Flow rates, Gaging stations, Data collections, Winds, Air temperature, Heat balance.
Identifiers: *USSR, *Ice melt, Lake Ladoga, Neva River, Ice movement, Ice thickness, Ice cover, Wind regime.

Discharge of the Neva River from ice melt in Lake Ladoga was calculated for 17 fall and 23 spring periods by indirect methods. The volume of ice flowing into the river from the lake was determined by the movement, flow rate and thickness of both the lake ice and of the ice formed on the river near the Petrokrepost' Gaging Station. The fall ice melt of the Neva River consisted of the ice from Lake Ladoga and of that formed on the river. The volume of ice formed on the river in the fall was determined by heat losses from the open water surface and was compared with the volume of ice contained in ice jams. Spring ice melt on the river was considerably greater than fall ice melt and consisted mainly of lake ice. The movement of ice from Lake Ladoga in both the fall and spring depended to a considerable extent on the wind regime above the lake during the period of ice movement. (See also W71-12021) (Josefson-USGS)
W71-12027

SELECTION OF A WINTER CONVERSION FACTOR FOR THE NEVA RIVER (Opty vybora znacheniy zimnego perekhodnogo koeffitsiyenta r. Nevy),
State Hydrological Inst., Leningrad (USSR).
N. S. Chachina.
In: Ledovyye issledovaniya; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 184, p 106-119, 1971. 14 p, 3 fig, 2 tab, 7 ref, 5 append.

Descriptors: *Discharge coefficients, *Discharge (Water), *Runoff, *Seasonal, *Streamflow forecasting, Ice, River forecasting, Stage-discharge relations, Discharge measurement, Water levels, Ice jams, Surges, Probability, River flow.
Identifiers: *USSR, Neva River, Ice regime, Ice cover.

A winter conversion factor is a ratio of winter and summer discharges of water at identical river stages and may be used to calculate winter streamflow for designing hydraulic structures and for work in navigation and other branches of the national economy. A winter conversion factor was calculated for the Neva River for the period 1900-1966. Because of the complexity of stage-discharge relationships during the winter (ice jams and surge phenomena) and lack of measured winter discharges, the calculations obtained must be considered as only approximate. (See also W71-12021) (Josefson-USGS)
W71-12028

2D. Evaporation and Transpiration

A GRAVIMETRIC EVAPORATOR FOR BOG CORE SAMPLES (Vesovoy bolotnyy isparitel's peremeshcheniyem monolita),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 07B.
W71-11766

FIELD STUDY OF EVAPORATION - INSTALLATION, OPERATION, AND MAINTENANCE OF EQUIPMENT.
Snowy Mountains Engineering Corp. Canberra (Australia).

Australian Water Resources Council Technical Paper No 1, March 1971. 133 p, 22 fig, 1 tab, 9 ref, 4 append.

Descriptors: *Evaporation, *Lakes, *Instrumentation, *Reservoir evaporation, Meteorology, Data collections, Climatology, Energy budget, Meteorological data, Solar radiation, Temperature, Humidity.
Identifiers: *Australia.

This publication contains descriptions of the evaporation equipment used at three lakes in connection with the Australian Water Resources Council Field Study of Evaporation. The three lakes are Mundaring near Perth, Manton near Darwin and Cataract near Sydney. Details are given of the installation, operation, and maintenance of equipment at the raft sites, and the daily-operated and the weekly recording meteorological land stations, and also other equipment which is associated with the above installations. Lake evaporation is measured by the Bulk Aerodynamic and Head Budget methods. These measurements are related to meteorological parameters, measured at land stations in the vicinity of the lakes. (Knapp-USGS)
W71-11771

A STUDY OF EVAPOTRANSPIRATION FROM A HIGH ALTITUDE MEADOW,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
Gideon Abraham.
M Sc Thesis, Wyoming University Graduate School, June 1971. 40 p, 6 fig, 12 tab, 15 ref, append. OWRR Project B-003-WYO (2).

Descriptors: *Evapotranspiration, *Wyoming, *Lysimeters, Consumptive use, Grasslands, Grazing, Evaporation, Water balance, Meteorological data, Irrigation, Heat budget.
Identifiers: *Laramie (Wyo).

Evapotranspiration measurements were made in the 1970 growing season at the Biddick Ranch north of Laramie, Wyoming. Four methods were used to evaluate the monthly evapotranspiration: Lysimeter measurements, Lowry-Johnson, Blaney-Criddle, and modified Jensen-Haise methods. The lysimeter evapotranspiration measurements fall between those obtained by the Lowry-Johnson and Blaney-Criddle methods for the period June through August, but the estimate by the Jensen-Haise method is higher than all the others. The lysimeter measurement for the month of May was high. The reason for this could be that during the initial stage of operation the soil was not fully saturated and water percolated down, thus increasing the measured lysimeter value. For the period June through August, the lysimeter shows no distinctive peak, though the evapotranspiration should increase with the stage of growth. The other two methods show peak use in July. (Knapp-USGS)
W71-11785

GLOBAL DISTRIBUTION OF NET RADIATION ACCORDING TO A NEW FORMULA,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 02B.
W71-12112

EVAPORATION FROM RICE AT GRIFFITH, NEW SOUTH WALES,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
G. N. Evans.
Agricultural Meteorology, Vol 8, No 2, p 117-127, March 1971. 5 fig, 1 tab, 8 ref.

Descriptors: *Evaporation, *Evaporation pans, *Rice, *Lysimeters, *Water balance, Estimating equations, Soil-water-plant relationships, Semiarid climates, Advection, Wind velocity, Crop response, Temperature, Solar radiation, Transpiration, Correlation analysis.
Identifiers: *Net radiation, *Crop roughness, *Agroclimatology, *Seedlings.

As part of a water balance study in a semiarid area of inland SE Australia, field measurements were made of daily evaporation from rice growing in standing water in a lysimeter. Comparison of lysimeter evaporation data and Van Bavel combination equation calculations yielded low correlations. The results were improved by using a relationship between rice roughness length and windspeed, derived from a regression. The simpler McIlroy equation requires a functional relationship between windspeed and an empirical transfer coefficient. When a variety of such relationships were plotted, considerable scatter occurred. However, when all relationships were used in the McIlroy equation, and compared with lysimeter data, correlation coefficients of 0.8 were consistently obtained. The mean value of the ratio of rice evaporation to class A pan evaporation was 0.98, with a correlation coefficient of 0.91 (0.1% level), indicating the usefulness of this method. Daily evaporation energy was considerably greater than net radiation, implying strong advection and generally high crop roughness. (Casey-Arizona)
W71-12113

SOME FIELD METHODS FOR OBTAINING MEANINGFUL LEAF DIFFUSION RESISTANCES AND TRANSPIRATION RATES,
Missouri Botanical Garden, St. Louis.
S. E. Taylor, and D. M. Gates.
Oecologia Plantarum, Vol 5, No 1, p 103-111, 1970. 2 fig, 18 ref. NSF Grant No G 22296, PHS Grant No ES-00139-04.

Descriptors: *Physiological ecology, *Leaves, *Transpiration, *Energy budget, Environmental effects, Estimating equations, Air temperature, Wind velocity, On-site data collections, Variability, Resistance, Instrumentation.

While there are many useful laboratory methods of measuring leaf transpiration rates, the only field measuring methods so far devised involve leaf severance, which is open to much criticism; and the energy budget method, which is complex and unwieldy. By using basic energy budget equations, heat dissipated by transpiring intact leaves may be expressed in terms of severed leaf parameters. The energy budget method may then be combined with the 2 most common severed leaf techniques, the potometer method and the quick weigh method. Field data was obtained from mature leaves of Leucothoe fontanesiana by the 2 combined methods and by the simple severed leaf method. Sample calculations are given and the results of the 3 methods are compared with results from lab tests on potted plants. The potometer-energy budget method was reliable within 5%, the quick weigh-energy budget method within 9% and the severed leaf technique within 14%. (Casey-Arizona)
W71-12115

2E. Streamflow and Runoff

STATISTICAL CHARACTERISTICS OF VELOCITY FLUCTUATIONS AT INTERMEDIATE SCALES IN A COASTAL PLAIN ESTUARY,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Oceanographic Labs.
For primary bibliographic entry see Field 02L.
W71-11742

APPLICATION OF THE TELEGRAPH EQUATION TO OCEANIC DIFFUSION: ANOTHER MATHEMATICAL MODEL,
John Hopkins Univ., Baltimore, Md., Chesapeake Bay Inst.
Akira Okubo.
Chesapeake Bay Institute Technical Report 69, Reference 71-3, Johns Hopkins University, March 1971. 35 p, 8 fig, 12 ref. ONR Contract N00014-67-A-0163-0006, NSF Contract AT (30-1) 3109 USAEC; Grant GA-16603.

Descriptors: *Diffusion, *Oceans, *Mathematical models, *Equations, Oceanography, Hydrology, Diffusivity, Mixing, Circulation, Water properties.
Identifiers: *Oceanic diffusion, *Telegraph equations.

The telegraph equation sheds light on the study of oceanic diffusion. Mainly, the finite propagation velocity characteristic of the telegraph equation is a promising feature. The behavior of the variance in both absolute and relative diffusion agrees with most other models. On the other hand, the presence of an advancing front where the substance is heaped, looks unrealistic for oceanic diffusion, although the heaping effect results partially from the purely mathematical initial condition of a Dirac spike. This heaped effect was not observed in diffusion experiments. Aside from the presence of this singular front, the telegraph equation can produce realistic patterns of the concentration distribution almost equal to that of other diffusion models. (Woodard-USGS)
W71-11753

THE TWO DIMENSIONAL SPATIAL ORGANIZATION OF CLEAR CREEK AND OLD MAN CREEK, IOWA,
Harvard Univ., Cambridge, Mass. Graduate School of Design.
Michael Woldenberg.
Harvard Papers in Theoretical Geography, No 43, June 23, 1971. 34 p, 7 fig, 6 tab, 20 ref. ONR Contract No 00014-67A-0298, Task Order NR 0004.

Descriptors: *River basins, *Geomorphology, *Spatial distribution, *Streams, Flow, Mathematical studies, Theoretical analysis, Model studies, Iowa, Streamflow.
Identifiers: *Fluvial systems, Asymmetry, Clear Creek (Iowa), Old Man Creek (Iowa).

The spatial organization of Clear Creek and Old Man Creek, adjacent 6th and 7th order eastward flowing tributaries of the Iowa River was investigated at the 7th, 6th, and 5th order levels. When the number of basins per order was compared to a model based on mixed hexagonal hierarchies of drainage basin areas, evidence for spatial complementarity, incomplete and overcomplete basins was found. It was possible to combine contiguous basins and interbasin areas to create equilibrium hierarchies. Both major basins are long and narrow, and the mainstreams flow asymmetrically near the southern sides of each valley. It is noted that the asymmetry allows the formation of more higher order streams than would be the case in a symmetrical basin. This, in turn, may allow the system to transport water and detritus with less frictional loss. (Woodard-USGS)
W71-11754

PROBLEMS OF HYDROLOGIC INSTRUMENTATION (Voprosy gidrologicheskogo priborostroyeniya).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 07B.
W71-11762

A RECTILINEAR CALIBRATION FLUME (Pryamolineynyy tarirovochnyy basseyn),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 07B.
W71-11763

ANALYTICAL AND LABORATORY INVESTIGATIONS ON THE USE OF INTEGRATING FLOATS FOR DISCHARGE MEASUREMENTS (Analiticheskiye i laboratornyye issledovaniya po primeneniyu poplavkov-integratorov dlya izmereniya raskhodov vody),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 07B.
W71-11764

THE GR-96 PYGMY CURRENT METER (Mikrovertushka GR-96),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 07B.
W71-11765

A PORTABLE WATER-LEVEL SENSING PROBE (Reyka perenosnaya kontaktnaya),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 07B.
W71-11767

FLOODS IN THE GUAYANILLA-YAUCO AREA, PUERTO RICO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-11772

FLOODS ON ROCK RIVER IN NORTHEASTERN JEFFERSON COUNTY, WISCONSIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-11773

CHANGES IN CHANNEL PATTERN AND SINUOSITY OF THE KANSAS RIVER--CAUSE AND EFFECT RELATIONSHIP OR RANDOM PROCESS,
Kansas Univ., Lawrence. Dept. of Geography.
For primary bibliographic entry see Field 08B.
W71-11777

THE IMPACT OF IMPOSING A WATER QUALITY STANDARD ON A LIVE STREAM,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05G.
W71-11806

INTERACTIVE MODELING OF A SMALL ARIDLAND WATERSHED ON A HYBRID COMPUTER,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
James R. McCarthy.
Available from the National Technical Information Service as PB-202 415, $3.00 in paper copy, $0.95 in microfiche. Completion Report, August, 1971, 85p, 45 fig, 8 tab, 41 ref. OWRR Project A-010-ARIZ (3).

Descriptors: *Arid lands, Rainfall-runoff relationships, *Watersheds, *Model studies, Data processing, Arizona, Infiltration, Multiple-peak flows, Reservoirs, Hydrograph analysis, Runoff.
Identifiers: Hybrid computers, *Arid land watersheds, *Afterburg Experimental Watershed, *Tucson (Ariz), Multistage systems.

A watershed is represented by a serial multistage system wherein each stage employs a generalized conceptual element. In the order that they 'process' rainfall, the stages are: initial abstractions, detention storage, translation, intermediate abstractions, channel storage, final abstractions, and outlet storage. The specific character of each stage is determined using data from an actual watershed and a hybrid computer. Data compiled from a sixteen acre tract on Atterbury Experimental Watershed near Tucson, Arizona are used. A broad spectrum of recorded conditions gives rise to problems typical of many involving rainfall-runoff relations on aridland watersheds. Infiltration becomes the important initial abstraction, and Horton's equation is modified to make capacity infiltration rate a function of time and precipitation intensity. The analysis related depression losses to storm variables, allowing estimation of the starting time of runoff. Included is a provision for subsequent depression losses that may occur, for example, during multiple-peak flows. The translation model as developed permits shifting the computed hydrograph to coincide with actual runoff. Linear reservoirs are used in storage stages. Limitations of the approach are diminished by a suggested 'parameter matrix' that increases reliability and predictions. Despite their limitations continued use of conceptual systems as a framework within which to discuss aridland watershed characteristics appears warranted. Comparative watershed modeling with analog, digital and hybrid computers is critically evaluated.
W71-11858

MEASURING THE INTANGIBLE VALUES OF NATURAL STREAMS, PART I: APPLICATION OF THE UNIQUENESS CONCEPT.
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 06G.
W71-11859

BASE-FLOW RECESSION IN ILLINOIS,
Illinois Univ., Urbana. Dept. of Geology.
Robert N. Farvolden.
Available from the National Technical Information Service as PB-202 419, $3.00 in paper copy, $0.95 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 42 (UILU-WRC-71-0042), August 1971, 51p, 11 fig, 5 tab, 5 ref, append. OWRR Project A-013-ILL (2).

Descriptors: *Base-flow, *Groundwater movement, *Hydrograph analysis, *Recession curves, *Surface runoff, *Wells, *Illinois, Streamflow, Regression analysis, Water temperature, Water levels.

Base-flow recession curves of nineteen Illinois streams were analyzed to determine the most significant factors which affected the base-flow recession rate. The eight most significant factors were (in order): number of days since the last major storm, average minimum daily temperature, average daily temperature, average maximum daily temperature, discharge at beginning of recession, average daily evaporation for one to five days preceeding the beginning of the recession, average daily evaporation for the duration of the recession and total runoff. A regression equation for these variations was derived. The relationship between base-flow and the water depth in various wells was studied. Significant correlations were obtained for dry weather flow for some wells but the relationships were found to be invalid during periods of storm runoff. Tritium analyses of eight water samples from two different watersheds were made. The results indicated that a normal gravity flow system exists with shallow groundwater moving toward the streams rather than leaking to underlying aquifers.
W71-11862

MATHEMATICAL MODEL OF THE COLUMBIA RIVER FROM THE PACIFIC OCEAN TO BONNEBILLE DAM, PART I: THEORY, PROGRAM NOTES, AND PROGRAMS,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05B.
W71-11867

MISSISSIPPI VALLEY MAPPING,
Geological Survey, Rolla, Mo. Topographic Div.
For primary bibliographic entry see Field 07C.
W71-11986

THE MARCH-APRIL 1969 SNOWMELT FLOODS IN THE RED RIVER OF THE NORTH, UPPER MISSISSIPPI, AND MISSOURI BASINS,
Joseph L. H. Paulhus.
Available from Superintendent of Documents, U.S. Government Printing Office, Wash., D. C. 20402 - price $1.25. National Oceanic and Atmospheric Administration Technical Report NWS 13, April 1971. 92 p, 45 fig, 12 tab, 9 ref, 3 append.

Descriptors: *Snowmelt, *Floods, *Mississippi River Basin, *Missouri River, North Dakota, South Dakota, Minnesota, Iowa, Melting, Overland flow, Runoff, Streamflow, Flood damage, Hydrologic data, Data collections, Peak discharge, Stream gages, Flow rates.
Identifiers: *Snowmelt floods (Upper Mississippi Basin-1969).

The 1969 snowmelt floods in the Red River of the North, Upper Mississippi, and Missouri Basins rank among the most severe in this region. Record flooding occurred at many places in the Red River of the North Basin and on tributaries of the Missouri River in the Dakotas and Iowa. Record or near-record flooding also occurred along tributaries of the Upper Mississippi River in Minnesota and Iowa and along the main stream from the headwaters down to Davenport, Iowa. Nine deaths were reported, and total damage was estimated at $150 million. The snowmelt floods were the result of a very wet autumn, an extremely heavy winter snowfall, and an unusually cold winter. The first extensive melting occurred in mid-March, at which time the snow cover was of record amounts in many areas because there had been little or no previous melting. Following several days of melting, which produced record or near-record streamflow in various tributaries, especially in Iowa and southern Nebraska, an abnormally cold air mass moved into the region. Below freezing temperatures retained the snow cover in April. Melting snow in April plus several wet spills during the month, produced the severe flooding. (Woodard-USGS)
W71-11996

APPLICATION OF RADAR IMAGERY TO DRAINAGE ANALYSIS,
Illinois Univ., Chicago.
For primary bibliographic entry see Field 07B.
W71-12008

RADAR SEA RETURN AS A FUNCTION OF WAVE HEIGHT AND WIND SPEED FOR FULLY DEVELOPED SEAS,
New York Univ., Bronx. Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 07B.
W71-12009

SEA-STATE MEASUREMENTS WITH A RADAR PROFILOMETER,
Naval Oceanographic Office, Washington, D.C.
For primary bibliographic entry see Field 07B.
W71-12010

COMPARISON OF MICROWAVE RADIOMETRY OF THE OCEAN DURING HURRICANE BEULAH (MISSION 57) WITH SIMULATED OCEAN SURFACE MEASUREMENTS,
Miami Univ., Coral Gables, Fla.
For primary bibliographic entry see Field 07B.
W71-12012

SELECTION OF A WINTER CONVERSION FACTOR FOR THE NEVA RIVER (Opty vybora znachenly zimnego perekhodnogo koeffitsiyenta r. Nevy),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W71-12028

CHEMICAL TECHNIQUES FOR DISCHARGE MEASUREMENTS OF SMALL FLOWS: AGUAS RIVER, ALMERIA, SPAIN (Aforos Quimicos De Pequenos Caudales: Rio Aguas (Almeria)),
Centro de Edafologia y Biologia Aplicada del Segura, Murcia (Spain).
V. S. Fresneda.
Boletin Geologico y Minero, Tome 82, Vol 2, 1971, p 58-61. 2 tab, 2 fig, 4 ref.

Descriptors: *Discharge measurement, *Sodium, *Chemical analysis, *Tracers, *Runoff coefficient, Streamflow, Sodium chloride, Chemical properties,

Dye releases, Ephemeral streams, Solubility, Toxicity, Costs, Mixing, Flame photometry, Injection, Stream gages.
Identifiers: *Lithium, *Lithium chloride, *Graphical integration, *Aguas River (Almeria-Spain).

This study checked streamflow measurements using sodium and lithium tracers. These chemical tracers were used to measure small flows of the Aguas River, an ephemeral stream near the Spanish Mediteranean. Sodium and lithium cations were used because they are easily soluble, non toxic, can be recognized by simple chemical tests, do not exist in the streams in high concentrations, and are inexpensive. Chemical stream gaging has the advantage of precision for undefined channels, although thorough mixing is required. The runoff coefficient, or streamflow discharge, is easily obtained by the tracers which are injected at a known concentration and downstream samples are time integrated and analyzed by flame photometry. Injecting 10 liters of sodium chloride, with a 126.92 gm/l of sodium ion concentration, gave a river concentration of 0.734 gm/l sodium. Sodium samples were taken at 15 second intervals, and graphically integrated with a planimeter to show a stream discharge of 14.19 liters/second. Sodium and lithium salts are good tracers for discharge measurements of flows less than 2 to 3 cubic meters per second. (Popkin-Arizona)
W71-12120

2F. Groundwater

ANALOG MODEL STUDY OF THE GROUNDWATER BASIN OF THE UPPER COACHELLA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04B.
W71-11752

U.S. GEOLOGICAL SURVEY TRACER STUDY, AMARGOSA DESERT, NYE COUNTY, NEVADA--PART 2: AN ANALYSIS OF THE FLOW FIELD OF A DISCHARGING-RECHARGING PAIR OF WELLS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 04B.
W71-11755

PATTERNS OF BORON ABUNDANCE IN GROUNDWATER OF THE GEORGIAN SSR (Nekotoryye zakonomernosti rasprostraneniya bora v podzemnykh vodakh Gruzii),
Gruzinskii Politekhnicheskii Institut, Tiflis (USSR).
B. Z. Zautashvili, and N. A. Kalandarishvili.
Geokhimiya, No 4, p 448-455, April 1971. 3 fig, 1 tab, 21 ref.

Descriptors: *Geochemistry, *Boron, *Groundwater, Distribution patterns, Hydrogeology, Structural geology, Geologic time, Salts, Bicarbonates, Calcium, Chlorine, Magnesium, Sulfates, Chlorides, Sodium, Aquifers.
Identifiers: *USSR, Georgian SSR, Greater Caucasus, Mineralization, Tectonics.

Boron-bearing groundwaters of the Georgian SSR are bicarbonate-sodium, bicarbonate-chloride-sodium and chloride-bicarbonate-sodium waters with a mineralization greater than 5-10 g/liter. The boron content increases with an increase in the chlorine, bicarbonate and sodium contents. The content of calcium, magnesium and sulfate ions is almost always inversely proportional to the boron content. The groundwaters with the most boron are found within the Southern Slope of the Greater Caucasus. Practically all of the boron-bearing groundwaters may be traced to areas of Cenozoic (intrusive) and Late Quaternary (effusive) magmatism. The boron content in groundwater may be determined by the gas and chemical composition of the groundwater, the structural-tectonic and hydrodynamic conditions of the region, the petrographic and facies character of the aquifers and the specific characteristics of the magmatic processes. (Josefson-USGS)
W71-11758

GEOCHEMISTRY, FORMATION AND DISTRIBUTION OF IODINE-BROMINE WATERS (Geokhimiya, formirovaniye i rasprostraneniye iodo-bromnykhvod),
Akademiya Navuk BSSR, Minsk. Laboratoriya Geokhimicheskikh Problem.
For primary bibliographic entry see Field 02K.
W71-11770

STATISTICAL POROUS MEDIA HYDRODYNAMICS,
Illinois Univ., Urbana. Dept. of Mining Metallurgy and Petroleum Engineering.
A. E. Scheidegger.
Illinois University Water Resources Center Research Report No 17, Jul 1968. 70 p, 5 fig, 1 tab, 16 ref. OWRR Project B-010-ILL (4).

Descriptors: *Stochastic processes, *Porous media, *Groundwater movement, *Statistical models, *Path of pollutants, Mathematical models, Probability, Thermodynamics, Flow, Mass transfer, Diffusion, Mixing, Dispersion.
Identifiers: *Multiphase flow.

An investigation was made of the stochastic aspects of single and multiple phase flow throughout porous media. The complete correspondence between transport theory and thermodynamics was established, and the corollaries of the thermodynamic stability conditions in transport theory were investigated. A further development of the correspondence between transported quantities and themodynamics was obtained by extending the theory to non-positive definite transported quantities. The theory was then applied to flow through porous media. A general investigation was made of the possibility of the development of a steady state in frontal displacement processes in porous media with and without 'fingers', with the result that this stabilization appears to be impossible. A new type of statistical model for flow through porous media was based on a random ensemble of topological graphs. (Knapp-USGS)
W71-11776

MAJOR THERMAL SPRINGS OF UTAH,
Geological Survey, Salt Lake City, Utah.
J. C. Mundorff.
Available from Utah Geological and Mineralogical Survey, 103 Utah Geological Survey Bldg., Univ. of Utah, Salt Lake City, 84112 - price $3.00. Utah Geological and Mineralogical Survey Water-Resources Bulletin 13, 1970. 60 p, 23 fig, 2 plate, 3 tab, 74 ref.

Descriptors: *Thermal springs, *Utah, Hot springs, Water yield, Water quality, Water temperature, Thermal water, Water chemistry, Discharge (Water), Water resources, Groundwater, Warm springs, Data collections, Hydrologic data.

As part of a study of the springs of Utah, reconnaissance data were obtained on the thermal, chemical, and geologic characteristics of the major thermal springs of Utah. Temperatures of the thermal springs studied ranged from 68 deg to 189 deg F. Nearly all thermal springs in Utah are in or near fault zones. Very few of these springs issue from volcanic rocks, but several springs are close to areas of late Tertiary or Quaternary volcanic rocks. Dissolved-solids contents of the springs range from as low as 214 ppm for a spring having a temperature of 80 deg F to as high as about 45,000 ppm for a spring having a temperature of 132 deg F. Most springs are sodium chloride in type, and all springs that contain more than 3,000 ppm of dissolved solids are of the sodium chloride type. Only two springs in the State, Roosevelt and Abraham Hot Springs, are in potentially valuable geothermal areas. Some thermal springs have large discharges, low dissolved-solids contents, and fairly low temperatures; these springs are valuable as water supplies for irrigation and stock use. An undesirable effect of the thermal springs is that they add significant amounts of water having high dissolved-solids contents to some streams and lakes. (Knapp-USGS)
W71-11779

HYDROGEOLOGIC DATA FROM GOVE, LOGAN, AND WALLACE COUNTIES, KANSAS,
Kansas Geological Survey, Lawrence; and Geological Survey, Colby, Kans.
For primary bibliographic entry see Field 07C.
W71-11783

GEOTHERMAL EXPLORATION IN THE WESTERN UNITED STATES,
California Division of Mines and Geology, San Francisco.
J. B. Koenig.
Paper, U N Symposium, Pisa, 1970. 23 p, 3 fig, 1 tab, 28 ref.

Descriptors: *Geothermal powerplants, *Geothermal studies, *Geothermal prospecting, Geologic investigations, Thermal energy, Temperature, *Warm springs, Thermal power, Electric power production, Wells, Steam, Brines, Drilling, Electric powerplants, *Thermal powerplants, Bibliographies, *Hot springs.
Identifiers: *Geothermal investigations, *Geothermal resources, Western United States.

Over 90% of the geothermal phenomena in the U S are in the 13 western states, comprising more than 1,000 warm and hot springs and fumarole localities. Some 100 can be considered hyperthermal. At least 6 producible fields have been discovered: The Geysers, Calif; Salton Sea, Calif; Casa Diablo, Calif; Beowawe, Nev; Brady's Hot Springs, Nev; and Yellowstone National Park, Wyo. Reservoir base temperatures probably exceed 200 deg C at these fields. The Geysers produce dry steam, Salton Sea produces brine, and the others produce hot water. Only at The Geysers is electric power being generated; 83,000 kw of capacity has been installed and facilities for an additional 110,000 kv are being constructed. Many insufficiently explored areas and marginal fields warrant additional directed exploration, including: Surprise Valley, Calif; the Carson Sink, Nev; the high Cascade Range in Calif, Oreg, and Wash; Walles Caldera, N Mex; parts of the Aleutian Islands, Alaska; and the island of Hawaii. At least 2 geothermal prospects, Clear Lake, Calif, and Steamboat Springs, Nev, have been abandoned because of problems of waste water disposal and plugging of wells. (USBR)
W71-11812

INVESTIGATION OF THE FEASIBILITY OF THE DEVELOPMENT OF A WATER RESOURCES MANAGEMENT MODEL FOR THE HIGH PLAINS AREA OF OKLAHOMA,
Oklahoma State Univ., Stillwater. Dept. of Civil Engineering.
Richard N. DeVries.
Available from the National Technical Information Service as PB-202 417, $3.00 in paper copy, $0.95 in microfiche. Oklahoma Water Resources Research Institute, Stillwater Completion Report, July 1971, 86p, 5 fig, 8 tab, 164 ref, 2 append. OWRR Project A-024-OKLA (1).

Descriptors: Management, *Oklahoma, Water law, *Groundwater, *Model studies, *Legal aspects, Social aspects, Groundwater movement, Computer programs, Computer models, *Aquifers, Aquifer characteristics.
Identifiers: *Management models, *Ogallala aquifer, Interdisciplinary research, High Plains (Oklahoma).

The feasibility was studied of applying a groundwater management model to the Ogallala aquifer of the Oklahoma Panhandle. The Texas Tech Model

was applied to a portion of the Oklahoma Ogallala, and parametric studies were made to determine the sensitivity to variability in input data. Parameters varied were permeability, coefficient of storage and flow from wells. The model proved sensitive to changes in the coefficient of storage. Also studied were the legal, economic, and physical factors affecting groundwater in Oklahoma. The laws of Oklahoma will allow a management agency to control the use of groundwater resources. A discussion of a managerial organization is included. An interdisciplinary approach in the development of a management model was made in the early stages of this research. An interdisciplinary model is proposed, which includes the physical, economic, and legal aspects of aquifer management. A new program was written to generate Theissen Polygons. This program executes about ten times faster than the Texas Tech program. An original algorithm is used. (See also W71-04931)
W71-11860

BASE-FLOW RECESSION IN ILLINOIS,
Illinois Univ., Urbana. Dept. of Geology.
For primary bibliographic entry see Field 02E.
W71-11862

APPLICATION OF REMOTE SENSING TO OCCURRENCE OF COLLAPSE SINKHOLES IN THE ALAFIA AND PEACE RIVER BASINS, FLORIDA,
Geological Survey, Tampa, Fla.
For primary bibliographic entry see Field 07B.
W71-12001

USE OF INFRARED IMAGERY TO LOCATE SURFICIAL AQUIFERS, DELMARVA PENINSULA, MARYLAND AND DELAWARE,
Geological Survey, Towson, Md.
For primary bibliographic entry see Field 07B.
W71-12006

STUDIES OF GROUNDWATER HYDROLOGY--I. HYDRAULIC PARAMETERS OF THE TERTIARY TAPPED IN THE COUNTRYSIDE OF CARTAGENA, MURCIA, SPAIN (Estudios de Hidraulica subterranea--I. Parametros hidraulicos del Acuifero Burdigaliense Captado en el Campo de Cartagena (Murcia)),
Instituto de Orientacion y Asistencia Tecnica del Sureste, Murcia (Spain).
V. S. Fresneda.
Instituto de Orientacion y Asistencia Tecnica del Sureste, Memoria 1968-70, 1971. 11 p, 2 tab, 2 fig, 15 equations, 3 ref.

Descriptors: *Aquifer characteristics, *Aquifers, *Transmissivity, *Storage coefficient, *Groundwater barriers, Hydrogeology, Tertiary period, Unsteady flow, Theis equation, Irrigation water, Agriculture, Economics, Drawdown, Discharge measurement, Chemical analysis, Sodium chloride, Electrical conductance.
Identifiers: *Jacob Method, *Cartagena, Murcia, Spain.

Hydrologic properties of aquifers in the countryside around Cartagena, a semi-arid region in Spain, were quantitatively measured by aquifer tests. Unsteady groundwater flow was assumed. The Theis equation and Jacob Method were used to calculate transmissivity, storage coefficient, and aquifer boundaries. Aquifers in this region are developed for agricultural purposes, and definition of their hydrologic parameters has agricultural and economic advantages. Drawdown was measured by electric line. Discharge was calculated from the time needed to fill a fixed-volume basin. The aquifers are porous, fossiliferous reef limestones, covering about 375 million square meters and located from 150 to 250 meters deep. The major aquifer is Tertiary (Miocene) in age. A pumping well produced 158 cubic meters per hour for 270 minutes, and water levels were observed in a well 27 meters away. Transmissivity was about 1,080 square meters per day, and storativity was about 448 times 10 to the minus four. Chemical analysis indicated a high sodium chloride content in water, micromhos per centimeter. Figures show drawdown plots for the Theis and Jacob methods and tables show drawdown and chemical data. Fifteen equations are developed with assumptions. (Popkin-Arizona)
W71-12103

STUDIES OF GROUNDWATER HYDROLOGY--II. HYDRAULIC PARAMETERS OF THE UPPER TERTIARY-LOWER QUATANARY, LOCATED IN THE COUNTRYSIDE OF MIJAR, ALMERIA, SPAIN. (Estudios de Hidraulica Subterranea--II. Parametros Hidraulicos Institute of Del Acuifero Contenido en el Terciario Superior-Cuaternario, en el Campo de Mijar, (Almeria)),
Instituto de Orientacion y Asistencia Tecnica del Sureste, Murcia (Spain).
V. Sanchez Fresneda.
Instituto de Orientacion y Asistencia Tecnica del Sureste, Memoria 1968-70, 1971. 12 p, 3 fig, 5 tab, 4 equations, 2 ref.

Descriptors: *Aquifer characteristics, *Aquifers, *Groundwater barriers, *Gravels, *Sands, Hydrogeology, Tertiary period, Quaternary period, Irrigation water, Marl, Clays, Limiting factors, Stratigraphy, Measurement, Theis equation, Transmissivity, Storage coefficient, Chemical analysis, Sodium chloride, Electrical conductance, Drawdown, Metamorphic rocks, Igneous rocks.
Identifiers: *Jacob method, *Radius of influence, *Mijar, *Almeria, Spain, Andesites, Triassic rocks, *Aquifer tests.

The aquifer under study is located in an arid Mediterrancan region of southeastern Spain, between the Upper Triassic (metamorphics) of Sierra de Alhamilla and the volcanic deposits (mainly andesites) Cabode Gata. Marl forms an impervious layer beneath the aquifer; the lower aquifer (Upper Tertiary age) consists of eruptive rocks, 80 to 100 meters thick; and the upper aquifer (Lower Quaternary age) consits of gravel and sand with some clay matrix. Knowledge of the aquifer's surface is limited by tectonic and stratigraphic complexities. Aquifer tests are practical methods for obtaining quantitative measurements of aquifer properties. A pumping well 110 meters deep, located 20 meters from the 105 meter deep observation well, and with an 80 HP motor, produced 48 liters of water per second for 48 hours to a fixed-volume basin; water levels were then measured in the observation well. Theis and Jacob analyses were used to calculate transmissivity of 2,900 square meters per day and a storage coefficient of 0.050. More observation wells radially from the pumping well could give good information on the radius of influence. Chemical analysis indicates that the groundwater is high in sodium chloride with a conductance of 2,340 micromhos per centimeter. Figures, tables and equations show drawdown and chemical data. (Popkin-Arizona)
W71-12117

NEW DATA ON THE GEOLOGY AND HYDROLOGY OF THE REUS BASIN (Nuevos Datos Sobre La Geologia E Hidrologia De La Depresion De Reus),
Paris Univ., Thonon-les-Bains (France). Center for Geodynamic Research.
F. Mangano, and Ph. Olive.
Agua: revista del centro de estudios, investigacion y applicaciones del aqua, Jan-Feb 1969, p 36-42. 3 fig, 2 tab, 10 ref.

Descriptors: *Groundwater basins, *Water wells, *Limestones, *Conglomerate rocks, *Water quality, Marl, Sands, Geology, Hydrology, Deposition (Sediments), Gypsum, Natural gas, Organic matter, Quaternary period, Sandstones, Tertiary period, Gravels, Fractures (Geology), Aquifers, Tritium, Saline water intrusion.
Identifiers: *Tectonic history, *Continental sediments, *Marine sediments, *Reus Basin (Spain), Evaporites, Geological dynamics.

This study is a summary based on a Ph.D. thesis presented to the Geological Dynamics Laboratory of the University of Sorbone. The Reus tectonic basin consists of Mioceneage sediments near Barcelona, Spain, along the semi-arid Mediterranean border. Wells average 150 meters deep, and are completed in limestone clastic conglomerates, overlain by foraminifera-rich blue marl, and capped by conglomerates which grade laterally into coarse sand. There is some discussion on the depositional environment of the rocks indicating evaporative and extreme arid conditions favorable to gypsum, natural gas and organic matter. Mesozoic tectonic history is reviewed. Three aquifers are: (1) Quaternary layers, yielding 10 cubic meters per hour (cmph); (2) Continental Tertiary layers, conglocrate and sandstone at 80 to 130 meters, yielding a steady30 cmph; and (3) Marine Tertiary layers, gravel, sandstone and fractured limestone at 100 to 150 meters, yielding 60 cmph. The Quaternary aquifer contains sodium--and magnesium-carbonate waters. The Marine Teriary aquifer contains calcium-sulfate and sodium carbonate waters. Tritium analysis of groundwater age, and salt-water intrusion problems are discussed. (Popkin-Arizona)
W71-12121

AQUIFER MODELING RESEARCH MEETING,
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
A. W. Sechrist.
The Cross Section, Vol 16, No 6, June 1970, p 1-2. 1 fig.

Descriptors: *Model studies, *Groundwater, *Management, *Computer, *Water management (Applied), Aquifers, Research and development, Withdrawal, Recharge, Water transfer, Numerical analysis.
Identifiers: *Ogallala Aquifer, *Texas Tech-High Plains Underground Water Conservation District.

Summarized is the 7th quarterly meeting of the Texas Tech-High Plains Underground Water Conservation District aquifer-modeling research group, held on June 3, 1970. The object of the project is to develop a mathematical management model of the Ogallala Aquifer that will predict aquifer response to present and future groundwater withdrawal and recharge schemes. The model will be useful to the District, individuals, and agencies developing plans for surface-water importation. Past research progress and a paper entitled 'Numerical Model of the Ogallala as a Management Tool' (presented at the Ogallala Symposium) were reviewed. The problem of modeling artificial groundwater recharge was discussed in terms of accuracy of prediction. This research project funded by a grant from the OWRR (USDI) to Texas Tech., and the District.
W71-12123

2G. Water in Soils

SOIL MATRIC SUCTION CHANGES WITH TIME IN PRESSED SOIL BRIQUETTES,
Minnesota Univ., Minneapolis. Water Resources Research Center.
Victor C. Fuentes.
Available from the National Technical Information Service as PB-202 347, $3.00 in paper copy, $0.95 in microfiche. Minesota Water Resources Research Center Bulletin 33, May 1971. 38 p, 12 fig, 2 tab, 58 ref. OWRR Project B-003-MINN (4).

Descriptors: *Moisture tension, *Soil water, *Soil structure, *Soil texture, *Aging (Physical), Tensiometers, Minnesota, Soil moisture cultivation, Colloids, Ion exchange, Adsoprtion, Soil formation, Clays, Clay minerals, Soil physical properties, Soil chemical properties.
Identifiers: *Soil matric suction, Thixotropy.

Variations in soil matric suctions with time were measured in soil samples to obtain information on the processes occurring as stable structural units

develop during aging. Water stability of synthetic soil aggregates increases with time. At low water contents (less than 0.258 g/g) there was a rapid decrease in soil matric suction with time after pressing; this indicates an increase in the free energy state of water in the system. At higher water contents the rate of decrease in matric suction was smaller. At 0.258 g/g, suction remained constant with time. At water contents over 0.258 g/g, soil matric suction increased with time. (Knapp-USGS)
W71-11729

SOME APPLICATIONS OF THERMOHYGROMETRIC ANALYSIS TO THE STUDY OF CLAY AND ASSOCIATED MINERALS,
General Electric Co., Ltd., Wembley (England). Hirst Research Centre.
M. H. Creer, J. B. C. Hardy, H. P. Rooksby, and J. E. Still.
Clay Minerals, Vol 9, No 1, p 19-34, July 1971. 8 fig, 1 tab, 8 ref.

Descriptors: *Clay minerals, *Analytical techniques, *Dehydration, *Differential thermal analysis, Mineralogy, Water of crystallization, Water of hydration, Hydration, Hydrate processes, Hydrates, Oxides, Iron oxides, Thermal properties.
Identifiers: *Thermohygrometric analysis, Aluminum oxides.

A new method of measuring the water evolved on thermal dehydration of a variety of clay minerals and related hydrated compounds is described. By placing the substance in a tubular furnace and passing over it a dry inert gas, water released on heating is carried to a sensitive electrolytic hygrometer for measurement. The heating is programmed to give a uniform rate of temperature rise, so that continuous monitoring of the evolved water permits discrimination between successive dehydration processes occurring at different temperatures. The procedure is appropriately termed thermohygrometric analysis (THA). The applications described include investigations of the thermal decomposition behaviors of hydrated aluminas and hydrated iron oxides, and of clay minerals such as kaolin, montmorillonite, chrysotile and micas. The relations between the results given by thermohygrometric analysis and those obtained by differential thermal analysis are discussed. As with DTA, the record trace from a THA examination gives a graphical representation of the dehydration process, but THA has an advantage in providing a quantitative measurement of the water evolved. (Knapp-USGS)
W71-11749

THE CORRESPONDENCE BETWEEN OPTICAL AND X-RAY MEASUREMENTS OF PARTICLE ORIENTATION IN CLAYS,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
J. S. Tchalenko, A. D. Burnett, and J. J. Hung.
Clay Minerals, Vol 9, No 1, p 47-70, July 1971. 13 fig, 5 tab, 23 ref.

Descriptors: *Clays, *Petrofabrics, *Clay minerals, Kaolinite, Illite, Optical properties, X-ray diffraction, Crystallography, Mineralogy, Electron microscopy.
Identifiers: Particle orientation (Clays).

The spatial arrangement of platy particles in a clay is defined by an orientation ratio which can be derived analytically from optical birefringence as well as from X-ray diffraction data. Measurements on kaolin slurries consolidated by increasing loads show that orientation ratios obtained experimentally by these two methods are equivalent. In contrast, particle orientation cannot be assessed objectively from electronmicrographs alone. A combined optical-X-ray study of two natural clays (London Clay and Lias Clay) revealed that the kaolinite crystals are oriented only slightly more than the illite crystals, and showed that the correspondence between optical and X-ray measurements is also valid for natural clays. (Knapp-USGS)
W71-11750

MATHEMATICAL MODEL OF THE COLUMBIA RIVER FROM THE PACFIC OCEAN TO BONNEVILLE DAM, PART II: INPUT-OUTPUT AND INITIAL VERIFICATION PROCEDURES,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05B.
W71-11868

RELATIVE IMPORTANCE OF WATER AND SOIL IN THE INDIRECT RADIOCAESIUM AND RADIOCOBALT CONTAMINATION OF IRRIGATED RICE FIELDS (Importance relative de l'eau et du sol dans la contamination indirecte en radiocesium et radiocobalt des rizieres irriguees),
European Atomic Energy Community, Ispra (Italy). Center of General Research; Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
For primary bibliographic entry see Field 05B.
W71-11979

PORE SIZE DISTRIBUTION STUDIES,
Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering.
A. Sridharan, A. G. Altschaeffl, and S. Diamond.
ASCE Proceedings , Journal of the Soil Mechanics and Foundations Division, Vol 97, No SM5, Paper 8151, p 771-787, May 1971. 9 fig, 2 tab, 10 ref.

Descriptors: *Porosity, *Clays, *Soil compaction, Soil physical properties, Soil mechanics, Consolidation, Compaction, Soil dynamics, Soil physics.
Identifiers: *Porosimeters.

Pore-size distribution data for pores as small as 0.016 micrometers were obtained by mercury porosimetry in a number of laboratory-prepared specimens. Statically-compacted specimens of kaolinite, illite, and Boston Blue Clay were evaluated, and changes in the pore-size distribution of the kaolinite were followed as a function of increasing static compaction. In this clay several distinct classes of pore sizes were recognized. Initial compaction reduced the gross pore sizes without influencing the finer classes. After the elimination of the gross pores, further compaction was at the expense of an intermediate class of pores above about 0.14 micrometers, pores finer than this being unaffected. Specimens of the kaolinite prepared from a slurry or by sedimentation showed substantially different pore-size distributions from the compacted clay. Drying shrinkage tended to eliminate the larger pores while leaving the smaller ones unaffected. Pore-size distribution appears to be a sensitive parameter with which to follow the effects of microstructural changes which may influence the engineering behavior of the material. (Knapp-USGS)
W71-11985

WATER-RESOURCES INVENTORY, SPRING 1969 TO SPRING 1970, ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
W. R. Powers, III, and G. A. Irwin.
Geological Survey Open-file Report, May 12, 1971. 19 p, 10 fig, 5 tab, 6 ref.

Descriptors: *Water resources, *Semiarid climates, *California, Groundwater, Surface waters, Water wells, Hydrologic data, Rainfall, Runoff, Evaporation, Data collections, Water level fluctuations, Water yield, Streamflow, Flow measurement, Flow rates, Water quality.
Identifiers: *Water inventory, *Mojave Desert region (Calif).

This is the fourth annual report prepared by the U.S. Geological Survey, in cooperation with the Antelope Valley-East Kern Water Agency (AVEK), to assist the agency in its program of basin management. The AVEK area is in the southwestern part of the Mojave Desert region about 35 miles north of Los Angeles, Calif. It covers the northern part of Los Angeles County and the southeastern part of Kern County. Precipitation, evaporation, streamflow, and groundwater level data for the period of this report (Spring 1969 to Spring 1970) show that precipitation and streamflow were slightly above normal, evaporation was about normal, and water levels continued to decline. The groundwater is generally a calcium sodium bicarbonate sulfate type with a range in dissolved solids from 120 to 2,100 milligrams per liter. Local areas have high nitrate, chloride, boron, and arsenic concentrations. (Woodard-USGS)
W71-11992

THE RELATION OF PARTICLE SIZE TO AVAILABLE MOISTURE IN SOILS OF ZUBAIR,
Iraq Institute for Research on Natural Resources, Baghdad.
J. S. Dougrameji.
Annals of Arid Zone, Vol 9, No 3, September 1970, p 169-174. 4 tab, 1 fig, 7 ref.

Descriptors: *Arid lands, *Foreign countries, *Irrigation, *Soil properties, *Soil moisture, Soil physical properties, Irrigation efficiency, Drainage effects, Soil water movement, Permeability, Particle size, Irrigation practices, Moisture availability.
Identifiers: *Iraq.

The Zubair area in southern Iraq is characterized by an arid climate with hot summers and mostly winter precipitation. To determine the amount and frequency of irrigation for the coarse, sandy soils, the water-retentive capacity of the soils was investigated. The percentage of retained moisture decreases as the soil becomes coarser, and the amount of suction needed to drain the soil becomes less as particle size increases. In these sandy soils, most of the available moisture is retained at suctions less than six atmospheres, and this value seems to be a maximum for use in estimating available moisture. Several tables show percentage of soil moisture of various samples and at various suctions. (Yensen-Arizona)
W71-12135

2H. Lakes

COEFFICIENTS OF ACCUMULATION OF STRONTIUM-90 AND STRONTIUM IN LAKE PLANTS AND PLANKTON,
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology; and Institute of the Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 05C.
W71-11669

FIELD STUDY OF EVAPORATION - INSTALLATION, OPERATION, AND MAINTENANCE OF EQUIPMENT.
Snowy Mountains Engineering Corp. Canberra (Australia).
For primary bibliographic entry see Field 02D.
W71-11771

FOURIER ANALYSIS OF WEATHER AND WAVE DATA FROM HOLLAND, MICHIGAN, JULY 1970,
Williams Coll., Williamstown, Mass.; and Western Michigan Univ., Kalamazoo.
William T. Fox and Richard A. Davis, Jr.
Technical Report No 3 under Office of Naval Research Contract Nonr-388-092 with Williams College, May 1, 1971. 79 p, 26 fig, 13 ref, 3 append. ONR Contract N00014-69-C-0151 Task No 388-092.

Descriptors: *Fourier analysis, *Waves (Water), *Lake Michigan, *Computer programs, *Water level fluctuations, Surface-groundwater relation-

ships, Beaches, Littoral drift, Temperature, Winds, Michigan, Currents (Water), Water circulation.
Identifiers: *Holland (Mich).

During July, 1970, weather and wave parameters were measured at two hour intervals on the beach and in the nearshore area two miles north of Holland, Michigan. Parameters measured include barometric pressure; wind speed and direction; air and water temperature; sky condition; lake and groundwater level, wave period and height; breaker depth, type, distance and angle; and longshore current velocity. The computer was used to calculate the phase and amplitude for the first 15 Fourier harmonics and to plot the observed data and cumulatives curves. The curves were influenced by low pressure systems which passed north of the area on 4, 9, 15 and 19 July. Wave height and direction are related to cyclonic winds moving counterclockwise around the low pressure system. Longshore current velocity can be predicted as a constant times the derivative of the barometric pressure. (Knapp-USGS)
W71-11775

MIXING OF DENSITY-STRATIFIED IMPOUNDMENTS WITH BUOYANT JETS,
California Inst. of Tech., Pasadena. W.M. Keck Lab. of Hydraulics and Water Resources.
For primary bibliographic entry see Field 05B.
W71-11780

ANALYSIS OF AIR-BUBBLE PLUMES,
California Inst. of Tech., Pasadena. W.M. Keck Lab. of Hydraulics and Water Resources.
For primary bibliographic entry see Field 05B.
W71-11781

NUMERICAL DIFFERENTIATION BY SPLINE FUNCTIONS AND ITS APPLICATION TO ANALYZING A LAKE TEMPERATURE OBSERVATION,
Cold Regions Research and Engineering Lab., Hanover, N.H.
Shunsuke Takagi.
Available as AD-719 697 from National Technical Information Service, Springfield, Va. 22151 - price $3.00 printed copy, $0.95 in microfiche. Cold Regions Research and Engineering Laboratory Research Report 293, February 1971. 18 p, 8 fig, 7 tab, 11 ref.

Descriptors: *Data processing, *Water temperature, *Lakes, *Mathematical studies, Limnology, Heat transfer, Numerical analysis, Regression analysis, Sampling, Stochastic processes.
Identifiers: *Spline functions, Interpolation.

Numerical differentiation by use of classical interpolation formulas yields a diversity of results. Consistent numerical differentiation can be performed by using a spline function as an interpolating function. As an application, temperature observed in a lake is numerically differentiated as a function of time and of depth by use of cubic splines. The deviation of the actual heat transfer mechanism from vertical heat conduction can thus be detected. The reliability of numerical differentiation by spline functions is shown in this example. (Knapp-USGS)
W71-11787

THE SELECTIVE ADSORPTION OF SODIUM BY CLAY MINERALS IN LAKES PONTCHARTRAIN AND MAUREPAS, LOUISIANA,
Louisiana Water Resources Research Inst. Baton Rouge. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W71-11864

THE LATERAL DISTRIBUTION OF CLAY MINERALS IN LAKES PONTCHARTRAIN AND MAUREPAS, LOUISIANA,
Louisiana Water Resources Research Inst., Baton Rouge. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W71-11865

SCIENTIFIC FUNDAMENTALS OF THE EUTROPHICATION OF LAKES AND FLOWING WATERS, WITH PARTICULAR REFERENCE TO NITROGEN AND PHOSPHORUS AS FACTORS IN EUTROPHICATION,
Organization for Economic Co-Operation and Development Paris (France).
For primary bibliographic entry see Field 05C.
W71-11942

SCIENTIFIC FUNDAMENTALS OF THE EUTROPHICATION OF LAKES AND FLOWING WATERS, WITH PARTICULAR REFERENCE TO NITROGEN AND PHOSPHORUS AS FACTORS IN EUTROPHICATION--ANNEX,
Organization for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 05C.
W71-11943

FERN LAKE MINERAL METABOLISM PROGRAM,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 05C.
W71-11978

THE WATER BALANCE OF LAKE VICTORIA: TECHNICAL NOTE,
Ministry of Mineral and Water Resources, Entebbe (Uganda). Dept. of Water Development.
H. L. de Baulny, and D. Baker.
Uganda Water Development Department Technical Note, 1970. 40 p, 25 fig, 9 append.

Descriptors: *Water balance, *Lakes, *Hydrologic data, *Data collections, Water level fluctuations, Meteorological data, Rainfall, Evaporation, Inflow, Discharge (Water).
Identifiers: *Africa, *Lake Victoria (Africa).

Hydrometeorological data involved with the water balance of Lake Victoria in Africa are evaluated. Computation values of the monthly and annual mean water balance for 35 years are included. The data are primarily concerned with rainfall, inflow, change in storage, outflow, and evaporation. The carryover effect of the lake is such that any one month's water level (or change in storage) is due not only to that month's rainfall but also to the preceding months' rainfall. For normal rainfall, the effect might still be felt on lake levels one or two months later. For more exceptional rains the effect might well be longer lasting. (Woodard-USGS)
W71-11998

USE OF REMOTE SENSORS IN CLASSIFYING LAKES IN WEST-CENTRAL FLORIDA,
Geological Survey, Tampa, Florida.
For primary bibliographic entry see Field 07B.
W71-12003

REMOTE-SENSING APPLICATIONS TO HYDROBIOLOGY IN SOUTH FLORIDA,
Geological Survey, Miami, Fla., Water Resources Div.
For primary bibliographic entry see Field 07B.
W71-12004

THE EFFECT OF CARBON ON ALGAL GROWTH--ITS RELATIONSHIP TO EUTROPHICATION,
Utah State Univ., Logan. Utah Water Research Lab.
For primary bibliographic entry see Field 05C.
W71-12068

NITROGEN AND CARBON DISTRIBUTION IN SEDIMENT CORES OF SELECTED WISCONSIN LAKES,
Wisconsin Dept. of Natural Resources, Madison; and Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 05C.
W71-12076

CHEMISTRY OF SURFACE SEDIMENTS OF SIXTEEN LAKES IN THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05C.
W71-12078

ZOOBENTHOS OF FIFTEEN LAKES IN THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05C.
W71-12080

THE CRUSTACEAN PLANKTON COMMUNITIES OF LAKES,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05C.
W71-12083

DISTRIBUTION AND ABUNDANCE OF PLANKTONIC CRUSTACEA IN PONDS NEAR GEORGIAN BAY (ONTARIO, CANADA) IN RELATION TO HYDROGRAPHY AND WATER CHEMISTRY,
Waterloo Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 05C.
W71-12085

PRELIMINARY CHARACTERIZATION OF LAKES IN THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO, USING DIATOM OCCURRENCES IN SEDIMENTS,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05C.
W71-12089

CRUSTACEAN PLANKTON COMMUNITIES IN FORTY-FIVE LAKES IN THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05C.
W71-12090

THE PRIMARY PRODUCTIVITY AND LIMITING NUTRIENTS OF LITTLE BROOKLYN LAKE,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 05C.
W71-12094

2I. Water in Plants

A CHECKLIST OF PLANKTONIC DIATOMS AND DINOFLAGELLATES FROM THE MOZAMBIQUE CHANNEL,
Museum National d'Historie Naturelle, Paris (France).
A. Sournia.
Bulletin of Marine Science, Vol 20, No 3, p 678-696, 1970. 1 fig, 1 tab, 27 ref.

Descriptors: *Systematics, *Diatoms, *Dinoflagellates, *Tropical regions, Indian Ocean, Seawater, Plankton, Phytoplankton, Biogeography.

Identifiers: Mozambique Channel, Africa, Madagascar.

A review of taxonomic studies on planktonic diatoms and dinoflagellates in the Mozambique Channel is presented. 345 species of diatoms and 189 species of dinoflagellates have been identified during 11 separate studies dating from 1907 through 1968. These are presented in the form of a checklist. The list should not only be of local interest, but could serve as a reference for the Indian Ocean and a useful example for tropical seas. Some biogeographic considerations are discussed. (Mortland-Battelle)
W71-11926

ARIZONA PLANT CLIMATE ZONES,
Arizona Univ. Tucson. Cooperative Extension Service.
Charles M. Sacamano.
University of Arizona, Cooperative Extension Service, Q Series Arizona Garden Guides, 1971, 4 p, 3 fig, 1 tab.

Descriptors: *Arizona, *Planting management, *Climatic zones, *Ornamentals, *Limiting factors, Arid lands, Plant growth regulators, Air temperature, Frost, Rainfall, Humidity, Light intensity, Moisture availability, Controls, Maps, Deserts, Vegetation, Microclimatology, Photoperiodism.

Arizona climate ranges from subalpine to tropical desert, and a large selection of ornamental plants may be grown. Very few plants are satisfactory throughout the state, so it is important that home gardeners know how local climate influences plant growth and which ornamentals grow well in particular areas. Controlling climatic factors are minimum winter temperature, frost occurrence, rainfall distribution, humidity, day length and light intensity. Water availability and rainfall are important aspects of climatic controls on plant growth. A plant-climate zone map, based on 5 different zones, is presented. The elevation-based zones are Cold Mountainous (6000 to 8000 ft.), Cool Plateau Highlands (4000 to 6000 ft.), High Altitude Desert (3300 to 5000 ft.), Mid-Altitude Desert (2000 to 4000 ft.) and Low-Altitude Desert (100 to 2000 ft.). Climate, vegetation pattern, and suggested ornamentals are discussed for each zone. The role of microclimates is reviewed. A climatic table for Arizona cities is included. (Popkin-Arizona)
W71-12098

SOIL WATER ABSORPTION CAPABILITIES IN SELECTED SPECIES OF ANURANS,
New Mexico State Univ., University Park. Dept. of Biology.
R. F. Walker, and W. G. Whitford.
Herpetologica, Vol 26, No 4, p 411-418, December 1970. 4 fig, 16 ref.

Descriptors: *Amphibians, *Soil moisture, *Physiological ecology, *Moisture uptake, *Xerophilic animals, Frogs, Toads, Animal behavior, Animal physiology, Environmental effects, Ecological distribution, Mode of action, Loams, Estimating equations, Desiccation, Laboratory tests, Habitats, Moisture tension, Moisture stress, Absorption, Water loss, Osmotic pressure, Arid lands.
Identifiers: *Anurans, *Sandy loams, *Fossorial animals, *Body surface area.

Amphibians have a permeable skin and lose water rapidly. Since many species live in xeric habitats, they must have developed mechanisms to compensate for cutaneous water loss. Six amphibian species from various habitats were partially dehydrated and placed in a standardized test soil. Their ability to rehydrate by absorption of soil moisture was tested for each species at differing soil moisture tensions. Positive correlations were found between the abilities of the animals to absorb soil moisture and their natural habitat and behavior. Three fossorial species from xeric habitats, Bufo cognatus, Scaphiopus hammondi and S. couchi demonstrated absorption thresholds between 2.5-3.0 atm. The other 3 species from more mesic habitats had thresholds at lower soil moisture tensions. Distributions of anurans are probably determined by factors such as desiccation toleration abilities, storage and utilization of bladder water and the relative ability to reabsorb soil water. (Casey-Arizona)
W71-12111

SOME FIELD METHODS FOR OBTAINING MEANINGFUL LEAF DIFFUSION RESISTANCES AND TRANSPIRATION RATES,
Missouri Botanical Garden, St. Louis.
For primary bibliographic entry see Field 02D.
W71-12115

WATER AND WILD LIFE,
Cape Town Univ. (South Africa). Percy Fitzpatrick Institute of African Ornithology.
J. M. Winterbottom.
South African Journal of Science, Vol 67, No 3, p 101-102, March 1971.

Descriptors: *Wildlife habitats, *Water holes, *Arid lands, Water shortage, Environmental effects, Wildlife.

The western part of South Africa is arid-semiarid with a markedly seasonal rainfall. Under natural conditions, the larger animals are concentrated at the permanent water sites during the dry season and then disperse over wide areas during the rainy season. In areas where the rainfall is extremely irregular, the animals are nomadic, following the widely separated rains and taking advantage of the resulting temporary vegetation. Man's activities in the environment have severely affected both ways of life and set into motion some highly destructive cycles. Farm fencing has disrupted normal game movements, heavy silt loads in streams from bad farming have destroyed important watering areas, swamp drainage has destroyed habitats and overgrazing resulting from these and many other factors have further destroyed habitats and set into motion massive soil erosion cycles. Some species have benefitted from such innovations as boreholes, irrigation canals and reservoirs, but for most the outlook is bleak. (Casey-Arizona)
W71-12129

2J. Erosion and Sedimentation

ORIGIN OF MAJOR CYCLICITY OF EVAPORITIES AND BITUMINOUS ROCKS: AN ACTUALISTIC MODEL,
Leiden Rijksuniversiteit (Netherlands). Inst. of Geology and Mineralogy.
For primary bibliographic entry see Field 02L.
W71-11731

ANIMAL-SEDIMENT RELATIONS IN SHALLOW WATER BENTHIC COMMUNITIES,
Chicago Univ., Ill. Dept. of Geophysical Sciences.
For primary bibliographic entry see Field 05C.
W71-11732

THE MAGNETIC ANISOTROPY OF SAMPLES FROM THE DEEP SEA DRILLING PROJECT LEG 1, ORANGE, TEXAS TO HOBOKEN, N. J.,
Southampton Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 02L.
W71-11734

PYROPHYLLITE AND TALC IN WATERS OFF THE SOUTHEASTERN UNITED STATES,
Smithsonian Institution, Washington, D.C. Div. of Sedimentology.
For primary bibliographic entry see Field 05B.
W71-11735

GLACIAL-LIKE 'STRIATED FLOOR' ORIGINATED BY DEBRIS-LADEN TORRENTIAL WATER FLOWS,
H. J. Harrington.
American Association of Petroleum Geologists Bulletin, Vol 55, No 8, p 1344-1347, August 1971. 4 fig.

Descriptors: *Erosion, *Deserts, *Flash floods, Cloud bursts, Mudflows, Sediment transport, Scour, Glaciation.
Identifiers: Striated boulders, Atacama Desert, Chile.

The location of a striated block of rhyolitic tuff, embedded in the alluvium of Quebrada de Tambores, Atacama Desert, Chile, and the characteristics of the markings show that the glacial-like striation is due to the rasping action of debris carried by torrential water floods. The elevation is far below that reached by any Pleistocene glacier in northern Chile. (Knapp-USGS)
W71-11739

EROSION AND SEDIMENTATION,
Geological Survey, Fort Collins, Colo.
C. F. Nordin, Jr.
Transactions, American Geophysical Union, Vol 52, No 6, p 292-295, June 1971. 85 ref.

Descriptors: *Sedimentation, *Erosion, *Sediment transport, *Reviews, Bibliographies, Channel morphology, Streamflow, Flow characteristics, Model studies, Stochastic processes, Sedimentology, Bibliographies.

Research activities in erosion and sedimentation processes have expanded broadly during the past several years and have kept pace with generally accelerated developments in all phases of hydrology and water resources investigations. This short review presents a cross section of activities in the fields of erosion and sedimentation and includes a bibliography of 96 citations. (Woodard-USGS)
W71-11740

BOTTOM CURRENTS ON THE NEW ENGLAND CONTINENTAL RISE,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
H. B. Zimmerman.
Journal of Geophysical Research, Vol 76, No 24, p 5865-5876, August 20, 1971. 10 fig, 1 tab, 58 ref.
ONR Contract N00014-68-A-0215-0003.

Descriptors: *Ocean currents, *Continental slope, *Sedimentation, Sediment transport, Continental shelf, Current meters, Data collections, Dispersion, Erosion, Turbidity currents, Topography, Sedimentary structures, Stratigraphy, Oceanography.
Identifiers: Continental rise.

Current meters were placed approximately 2 meters off the bottom at depths from 2900 to 5000 meters on the continental rise near the New England seamount chain. Current velocities greater than 15 cm/sec were recorded in a west-southwest direction, parallel to the regional contours. The greatest velocity recorded was 26.5 cm/sec toward the southwest. Spectrum analyses of the time-series curves have resolved periodic motions superimposed on secular, contour-following trends. An interaction between the contour current and the Gulf Stream is also apparent. These data suggest that the contour current, a Western Boundary Undercurrent, is competent to transport and erode continental rise sediments. A significant sediment dispersal system parallel to the regional slope is confirmed to be operative on the present-day continental rise. (Knapp-USGS)
W71-11743

EXPERIMENTAL EROSION OF CALCAREOUS OOZE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
J. B. Southard, R. A. Young, and C. D. Hollister.

Journal of Geophysical Research, Vol 76, No 24, p 5903-5909, August 20, 1971. 3 fig, 1 tab, 23 ref. ONR Contracts Nonr 1841 (74) and 241 (9).

Descriptors: *Erosion, *Bottom sediments, *Ocean currents, Oceanography, Currents (Water), Model studies, Silts, Carbonates, Scour, Sedimentary structures, Ripple marks, Clays, Particle size.
Identifiers: Calcareous ooze.

Flume experiments on the erosion of abyssal calcareous ooze in shallow uniform flows of sea water show that erosion velocities range from 7-10 cm/sec soon after rapid deposition of the bed to 15-20 cm/sec after a few tens of hours. Continuing erosion produces shallow irregular longstream lineations but no sediment ripples. On the assumption of a hydrodynamically smooth boundary in the deep ocean, the measured erosion velocities can be approximately corrected for the effects of flow depth and water temperature different from oceanic conditions; even with this correction, the measured velocities are less than twice as great as current velocities common in the deep ocean. (Knapp-USGS)
W71-11746

HIGH-RESOLUTION SEISMIC PROFILES AND GRAVITY CORES OF SEDIMENTS IN SOUTHERN LAKE MICHIGAN,

Illinois State Geological Survey, Urbana; and Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
J. A. Lineback, D. L. Gross, R. P. Meyer, and W. L. Unger.

Illinois Geological Survey Environmental Geology Notes, No 47, June 1971. 41 p, 20 fig, 1 plate, 13 ref, append.

Descriptors: *Sedimentology, *Lake Michigan, *Seismographs, *Bottom sediments, *Sedimentary structures, Bedrock, Geology, Geologic time, Stratigraphy, Sediments, Test procedures, Instrumentation.
Identifiers: *Sediments (Seismic profiles).

Sedimentary units 1 foot or more thick were identified on high-resolution, sub-bottom, seismic reflection profiles taken in southern Lake Michigan along a 400-mile cruise in June, 1970. Beneath the soft sediments that floor the lake, glacial till was clearly identifiable, as was the irregular surface of underlying Paleozoic bedrock. Gravity cores were taken along the profile track and used to correlate the acoustically reflecting horizons and the stratifications in the sediments. The geophysical record provided a continuous cross section that permitted detailed correlation between the widely spaced cores. Three main sedimentary units were recognized in most of the seismic profiles: lacustrine clays (Lake Michigan Formation), glacial deposits (Equality and Wedron Formations), and Paleozoic bedrock. Three separate episodes of sedimentation in the Lake Michigan Formation also were recognized. The oldest is recorded by a sequence of reddish brown clay (Sheboygan and South Haven Members) that is thickest in the northwestern part of the southern lake basin and pinches out toward shore. (Woodard-USGS)
W71-11751

URANIUM CONTENT OF RECENT OCEAN SEDIMENTS IN THE ZONES OF UPWELLING (Kontsentratsiya urana v sovremennykh okeanicheskikh osadkakh v zonakh pod'yema vod),

Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
G. N. Baturin, A. V. Kochenov, and Yu. M Senin.

Geokhimiya, No 4, p 456-462, April 1971. 1 fig, 2 tab, 27 ref.

Descriptors: *Sedimentation, *Deposition (Sediments), *Sediments, *Geochemistry, Uranium radioisotopes, Bottom sediments, Diatomaceous earth, Diagenesis, Mud, Sands, Silts, Organic matter, Phosphorus, Sea water, Continental shelf, Atlantic Ocean, Benthic fauna, Benthos, Hydrogen sulfide, Phosphates.
Identifiers: USSR, *Africa, *Upwelling, *Uranium, Benthonic water, Sea shelves, Shelf seas.

The uranium content of recent ocean sediments in the zone of upwelling near continental shores of the Southwest and West African Shelf is several times higher than that in deepwater ocean sediments. The predominant sediments in these zones are calcareous and terrigenous sands and silts. Diatomaceous muds, which are found between the south latitudes of 18 and 24 deg in a 30-40 mile-wide band at depths of 130-150 m, are also found in the zone of upwelling. The uranium content of diatomaceous muds is high, ranging from 0.003 to 0.006%. Maximum uranium values were observed in the diatomaceous muds deposited at depths greater than 60-80 m. The phosphorus content of diatomaceous muds was considerably higher than that of pelagic sediments and averaged 0.5-1%. Three forms of phosphorus were distinguished in the sediments examined; (1) trace phosphorus, which is predominant in diatomaceous muds; (2) organogenic-phosphate detritus; and (3) diagenetic phosphate grains and nodules. The intensive precipitation of uranium from sea water was associated with accumulation of large amounts of organic matter and phosphorus in the bottom sediments owing to the high biological productivity of shelf seas and with hydrogen sulfide contamination of the benthonic waters. The accumulation of uranium in the biogenous and diagenetic phosphates was syngenetic in that it occurred concurrently with the formation of the sediments. (Josefson-USGS)
W71-11757

HYDROGEN SULFIDE IN SEDIMENTS OF A CONTINENTAL SLOPE OF THE NORTHWESTERN PART OF THE PACIFIC OCEAN (Serovodorod v osadkakh beregovogo sklona severo-zapadnoy chasti Tikhogo okeana),

Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
A. G. Rozanov, I. I. Volkov, N. N. Zhabina, and T. A. Yagodinskaya.

Geokhimiya, No 5, p 543-550, May 1971. 4 fig, 1 tab, 17 ref.

Descriptors: *Geochemistry, *Hydrogen sulfide, *Sulfur compounds, *Pacific Ocean, *Sediments, Sedimentation, Sedimentary rocks, Diagenesis, Bottom sediments, Mud-water interfaces, Sulfur bacteria, Sulfates, Oxidation, Reduction (Chemical), Organic matter.
Identifiers: USSR, Black Sea, Japan Trench, Thiosulfates, Mud waters.

A study of the transformation of sulfur in recent marine sediments is important for understanding the geochemistry of this element in sedimentary rocks and of chalcophile elements closely associated with it. The behavior of sulfur and, specifically, the appearance of hydrogen sulfide influence the geochemistry of many elements and occasionally determine their chemical behavior in recent sediments. A study was made of the distribution of hydrogen sulfide, sulfates and thiosulfates in mud waters of borrom sediments of the Japan Trench and an adjoining continental slope of the Pacific Ocean. The bottom sediments contain as much as 100-150 mg of free hydrogen sulfide/liter. These values exceed the hydrogen sulfide content in Black Sea sediments, which generally contain less than 100 mg/liter, and are the highest recorded to date in marine sediments. Free hydrogen sulfide was formed from the bacterial reduction of mud water sulfates, whose content decreased sharply in the sediments. A high thiosulfate content was observed in the mud waters when the concentration of hydrogen sulfide in the sediments was high. (Josefson-USGS)
W71-11760

STATISTICAL PROPERTIES OF DUNE PROFILES,

Geological Survey, Washington, D.C.
Carl F. Nordin, Jr.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 - Price 50 cents. geological Survey Professional Paper 562-F, 1971. 41 p, 44 fig, 7 tab, 31 ref.

Descriptors: *Dunes, *Sand waves, *Alluvial channels, *Bed load, *Sedimentary structures, Sediment transport, Alluvium, Scour, Ripple marks, Subcritical flow, Turbulent flow, Statistics, Statistical methods, Stochastic processes, Open channel flow, Channel morphology.
Identifiers: Channel geometry, Bed topography.

Properties of sand waves formed by subcritical unidirectional water currents were investigated by statistical analyses of records of streambed profiles. Records of bed elevation as a function of distance along the channel, and time records at a fixed point of the channel were collected in three laboratory flumes. All bed material was fine sand. The continuous analog records were converted to discrete data points and were analyzed by digital computer. Both types of records can be approximately represented as stationary Gaussian processes. When the data are standardized and the lengths or distances are expressed as ratios of the mean duration between zero crossings, the statistical properties of all the flume data are similar, with no distinguishing characteristics that can be attributed to size of flume or to whether the bed forms were ripples or dunes. Field data, however, reflect the influence of large alternate bars that were not present in the flumes. Observed values of the number of zero and h-level crossings, the mean duration between zero crossings, and the mean duration of upward excursions in the time process above the fixed level h compared reasonably well with theoretical values for the Gaussian model. Observed distributions of these durations can be approximated by a gamma distribution with parameters that relate to h, where h is measured in units of standard deviation from the mean bed level. (Knapp-USGS)
W71-11774

CHANGES IN CHANNEL PATTERN AND SINUOSITY OF THE KANSAS RIVER--CAUSE AND EFFECT RELATIONSHIP OR RANDOM PROCESS,

Kansas Univ., Lawrence. Dept. of Geography.

For primary bibliographic entry see Field 08B.
W71-11777

THE SELECTIVE ADSORPTION OF SODIUM BY CLAY MINERALS IN LAKES PONTCHARTRAIN AND MAUREPAS, LOUISIANA,

Louisiana Water Resources Research Inst. Baton Rouge. Dept. of Geology.
R. E. Ferrell and R. A. Brooks.

Clays and Clay Minerals, Vol 19, p 75-81, 1971. 4 fig, 2 tab, 18 ref. OWRR A-007-LA (4)

Descriptors: *Clay minerals, Geochemistry, *Sediment-water interfaces, *Sediment distribution, Bottom sediments, Louisiana, *Adsorption, *Sodium, *Ion exchange, Lakes, Cation exchange.
Identifiers: *Lake Pontchartrain, *Lake Maurepas, Clay-water systems.

Ion exchange analyses of the clay-sized fraction of sediments in Lakes Pontchartrain and Maurepas suggest the selective adsorption of Na at the expense of Mg. The literature suggests that Mg should be preferentially adsorbed. As the chlorinity of the lake waters increases from 300 mg/l to 3250 mg/l, the percentage of exchangeable Na increases from 13.6 to 30.6 while the percentage of exchangeable Mg decreases from 65.6 to 36.8. The observed exchangeable Na percentages are higher than the ones calculated from the sodium-adsorption-ratios. The difference is attributed to an increase in the Na exchange constant of the sediment and therefore an increased selectivity for Na. With an increase in chlorinity, montmorillonite increases from 47 to 61 percent and the total of the exchangeable cations (Na, Mg, Ca, K) increases from 36 to 82 m-equiv./100 g. (See also W71-11865) (Ferrell-LSU)
W71-11864

THE LATERAL DISTRIBUTION OF CLAY MINERALS IN LAKES PONTCHARTRAIN AND MAUREPAS, LOUISIANA,
Louisiana Water Resources Research Inst., Baton Rouge. Dept. of Geology.
R. A. Brooks, and R. E. Ferrell, Jr.
Journal of Sedimentary Petrology, Vol 40, No 3, p 855-863, Sep 1970. 11 fig, 18 ref. OWRR A-007-LA (3).

Descriptors: *Clay minerals, Geochemistry, *Sediment-water interfaces, *Sediment distribution, Bottom sediments, Louisiana, Lakes, Kaolinite, Montmorillonite, Illite, Clays, Potassium, Sodium.
Identifiers: *Lake Pontchartrain, *Lake Maurepas, Clay-water systems, Ionic gradients, Potassium/hydrogen ratio, Sodium/hydrogen ratio.

Lakes Pontchartrain and Maurepas are large bodies of brackish water. The chemical components of this saline environment influence the lateral distribution of clay minerals. Clay minerals are supplied to the lakes by various rivers and bayous and by erosion of the shoreline. The water level in the lake system fluctuates rapidly; and, as a result, the salinity of any given area is quite variable over a given period of time. However, the trends of the ionic gradients are fairly constant. Clay minerals flocculate and settle in reasonably consistent patterns in response to these compositional gradients. Kaolinite flocculates first and settles in areas of lowest salinity. Montmorillonite has its greatest concentration in the higher salinity portions of the lake and is the most resistant to settling. Illite also appears to be concentrated in the sediments of the higher salinity areas; however, some of the illite may be authigenic. The potassium to hydrogen and sodium to hydrogen ratios in the higher salinity portions of the lake approach the ratios which define the hydrochemical stability field of K-mica, which suggests that illite may be formed as an alteration product of other clay material. (See also W71-11864) (Brooks-LSU)
W71-11865

SOIL POLLUTION: EROSION EFFECTS IN SOIL.
Defense Documentation Center, Alexandria, Va.
For primary bibliographic entry see Field 05B.
W71-11873

A KINETIC MODEL FOR THE CHEMICAL COMPOSITION OF SEA WATER,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 02K.
W71-11990

OCEAN BOTTOM SURVEYING WITH AERIAL PHOTOGRAPHY,
Massachusetts Inst. of Tech., Cambridge. Experimental Astronomy Lab.; and Naval Oceanographic Office, Washington, D.C.
For primary bibliographic entry see Field 07B.
W71-12013

SURFACE EFFECTS AND SUBMERGED FEATURES,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 07B.
W71-12014

FINE ALLUVIAL FILLS IN THE ORANGE AND VAAL BASINS OF SOUTH AFRICA,
Chicago Univ., Ill.
K. W. Butzer.
Proceedings, Association of American Geographers, Vol 3, p 41-48, 1971. 2 fig, 1 tab, 26 ref. Project No 2344, 1969, Grant No GS-3013, 1970.

Descriptors: *Alluvial channels, *Gullies, *Semiarid climates, *Flood plains, *Geomorphology, River basins, Aeolian soils, Geologic investigations, Geographical regions, Colluvium, Vegetation effects, Climatic data, Arid lands.
Identifiers: *Gully-cutting, *Alluviation, *South Africa, *Fina alluvial fills.

The fine-grained alluvial fills of South Africa are remarkably analogous to those of Arizona and New Mexico. Although gully-cutting in both regions has been a scourge since the 19th century, the close coincidence of gullying with silty alluvium has not been generally recognized. The fine-grained fills in South Africa are best developed in the drainage systems of the semiarid continental interior where readily erodible rocks provide an abundant supply of sediment. Within the Vaal and upper Orange drainage systems, well-preserved terraces record 2 major generations of fine-grained alluvial fill. Represented in the major valleys, the 'Younger Fill' terraces lie at 3-8 m above mean flood levels and lack a real soil profile. The 'Older Fill' comprises 2 or 3 much older discrete bodies of alluvium, separated by intervals of downcutting or erosion, with the second generation usually resting directly on the first. Basic to any interpretation is the close dependence of geomorphic equilibrium upon vegetation cover. Older Fill suggests slow accumulation with an effective grass mat during moist periods. Rapid percolation reduced runoff, facilitating slow aggradation. Dissection periods probably occurred during drier climates with more open, shrubby vegetation. Younger Fill dissection is coincident with human disturbance. These cycles are analogous to the cut-and-fill cycles of the American Southwest. (Casey-Arizona)
W71-12109

2K. Chemical Processes

SPECIFIC ION ELECTRODES,
F. W. Karasek.
Research/Development, Vol. 21, No. 6, p 71-72, 74, June 1970. 3 fig, 1 tab, 6 ref.

Descriptors: *Electrodes, *Analytical techniques, Nitrates, Fluoride, Hydrogen, Sodium, Chlorides, Potassium, Biochemistry, Hydrogen ion concentration.
Identifiers: *Chemical interferences.

This paper is a tutorial review of the history, characteristics, applications, and future of specific ion electrodes. In addition to their use for laboratory analytical measurements electrodes are now being adapted for applications in continuous process control. These electrodes appear to be well established in a process monitoring version--hydrogen, sodium and chloride ion electrodes. The most significant recent addition has been the potassium electrode. The sensor exhibits high selectivity to potassium in the presence of large amounts of other ions. Corning has developed a microelectrode with dimensions in the micron range. It is designed to measure chemical and electrical changes in living cells and should prove quite useful in biological research. (McCann-Battelle)
W71-11684

ADIABATIC VACUUM DISTILLATION TO FRACTIONATE PARAFFIN HYDROCARBON MIXTURES (C8-C14),
Atlantic Richfield Hanford Co., Richland, Wash.
For primary bibliographic entry see Field 05A.
W71-11725

A TREATMENT OF COMPLEX IONS IN SEA WATER,
Illinois Univ., Urbana. Dept. of Physiology and Biophysics.
M. S. Mangel.
Marine Geology, Vol 11, No 2, p M24-M26, September 1971. 1 tab, 3 ref.

Descriptors: *Metals, *Water chemistry, *Sea water, *Equilibrium, Ions, Chemical reactions, Electrolytes, Aqueous solutions, Saline water.
Identifiers: *Complex ions.

The use of equioibria constants and ligand concentrations to evaluate complex ion concentrations in sea water is explained. The concentrations of complex ions of 26 metals are tabulated. (Kapp-USGS)
W71-11733

VERTICAL ADVECTION DIFFUSION AND REDOX POTENTIALS AS CONTROLS ON THE DISTRIBUTION OF MANGANESE AND OTHER TRACE METALS DISSOLVED IN WATERS OF THE BLACK SEA,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W71-11744

DISTRIBUTION OF PARTICULATE ALUMINUM IN THE GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W71-11745

SATURATION OF WATER WITH CALCIUM CARBONATE AND THE PARTIAL CARBON DIOXIDE PRESSURE IN THE BODIES OF WATER IN THE MOUTH OF THE KUBAN' RIVER,
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Don (USSR).
For primary bibliographic entry see Field 05C.
W71-11748

SOME APPLICATIONS OF THERMOHYGROMETRIC ANALYSIS TO THE STUDY OF CLAY AND ASSOCIATED MINERALS,
General Electric Co., Ltd., Wembley (England). Hirst Research Centre.
For primary bibliographic entry see Field 02G.
W71-11749

THE CORRESPONDENCE BETWEEN OPTICAL AND X-RAY MEASUREMENTS OF PARTICLE ORIENTATION IN CLAYS,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02G.
W71-11750

POTASSIUM MIGRATION IN RIVER WATERS (O migratsii kaliya v rechnykh vodakh),
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analiticheskoi Khimii.
V. V. Krasintseva, and L. V. Karelina.
Geokhimiya, No 4, p 442-447, April 1971. 8 tab, 3 ref.

Descriptors: *Geochemistry, *Surface runoff, *Alkali metals, *Water chemistry, *Potassium, *Sodium, Subsurface runoff, Low flow, Floods, Regression analysis, Correlation analysis, Precipitation (Atmospheric).
Identifiers: *USSR, *Volga River, Moscow Oblast, Kalinin Oblast, Regression equations, Correlation coefficients.

Data on potassium and sodium concentrations in river waters of the Upper Volga basin were examined during different periods of the year. The potassium content and K/Na ratio in these waters were higher during flood periods than during low-water periods. The potassium content in surface runoff at the Sareyevo Gaging Station was 6 times that of sodium. Surface runoff from forest plots contained higher amounts of potassium than surface runoff from field plots. Average K/Na ratios for river waters of different continents varied widely, from 0.16 to 0.5. A high potassium content may be expected in river waters of tropical forests of Africa and South America. Low K/Na ratios were observed for North America and Europe, where there is a high degree of industrial development. It may be assumed that the K/Na ratio in river waters

of the world will continue to decrease in areas of industrial growth. (Josefson-USGS)
W71-11756

PATTERNS OF BORON ABUNDANCE IN GROUNDWATER OF THE GEORGIAN SSR (Nekotoryye zakonomernosti rasprostraneniya bora v podzemnykh vodakh Gruzii),
Gruzinskii Politekhnicheskii Institut, Tiflis (USSR).
For primary bibliographic entry see Field 02F.
W71-11758

RADON CONTENT IN WATERS OF THE UPPER VOLGA (O soderzhanii radona v vodakh Verkhney Volgi),
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analiticheskoi Khimii.
V. K. Khristianov, and B. N. Korchuganov.
Geokhimiya, No 4, p 492-496, April 1971. 3 tab, 13 ref.

Descriptors: *Geochemistry, *Trace elements, *Water analysis, *Radium radioisotopes, *Tracers, Groundwater, Groundwater movement, Radioisotopes, Surface waters, Sampling, Hydrogeology, Equilibrium.
Identifiers: *USSR, *Radon, *Volga River, Oka River, Ruza River, Moscow River, Tvertsa River, Vazuza River, Protva River, Emanometer.

The possibility of using radon as a tracer to determine its behavior and its ratio to radium in waters of the Upper Volga basin was examined in connection with an analysis of 13 water samples from seven rivers in the USSR and of one sample from a borehole at the village of Sareyevo, Moscow Oblast. A high concentration of radon, exceeding 10-100 times its equilibrium content, was found in all of the samples studied. The minimum radon concentration was observed in the sample taken from the Ruza River 12 km below the dam of the Ruza reservoir. The maximum radon concentration was noted in the sample from the Volga River near the village of Yel'tsy. The radon content in groundwater of the borehold was 5-10 times that in river water. Groundwater of the Upper Volga basin contains moderate amounts of radon and conditions in the lowland rivers favor retention of large concentrations of this heavy gaseous element. A study of radon distribution in rivers is useful from the standpoint of resolving problems of hydrogeology, including those associated with identifying and calculating groundwater movement. (Josefson-USGS)
W71-11759

HYDROGEN SULFIDE IN SEDIMENTS OF A CONTINENTAL SLOPE OF THE NORTHWESTERN PART OF THE PACIFIC OCEAN (Serovodorod v osadkakh beregovogo sklona severo-zapadnoy chasti Tikhogo okeana),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02J.
W71-11760

EXPERIMENTAL STUDY OF THE INTERACTION OF METAMORPHOSED SEA BRINES WITH CALCIUM CARBONATE (Eksperimental'noye issledovaniye vzaimodeystviya metamorfizovannykh morskikh rassolov s karbonatom kal't-siya),
Moscow State Univ. (USSR). Dept. of Geochemistry.
N. K. Vlasova, and M. G. Valyashko.
Geokhimiya, No 5, p 610-615, May 1971. 3 fig, 1 tab, 15 ref.

Descriptors: *Geochemistry, *Brines, *Calcium carbonate, Calcium chloride, Sea water, Dolomite, Magnesium compounds, Sodium, Aqueous solutions, Halogens, *Chlorides, Thermodynamics, Free energy, Temperature, Pressure.
Identifiers: USSR, Magnesium chloride, Thermograms, Diffractograms, *Sea brines.

Considerable attention is being devoted in the Soviet literature to the problem of the origin of chloride (calcium chloride) brines. It was found by experiments that magnesium chloride in solutions with solid calcium carbonate is unstable and reacts with the formation of solid MgCO3 or dolomite and with the accumulation of calcium chloride in the solution. High temperature and time contribute to this process, with high temperature accelerating dolomite formation. Sodium does not participate in the exchange or in the accumulation of calcium chloride in the solution. The formation of calcium chloride brines occurs within the entire range of temperatures and pressures selected and does not depend upon the composition and concentration of the original sea brines. (Josefson-USGS)
W71-11761

GEOCHEMISTRY, FORMATION AND DISTRIBUTION OF IODINE-BROMINE WATERS (Geokhimiya, formirovaniye i rasprostraneniye iodo-bromnykhvod),
Akademiya Navuk BSSR, Minsk. Laboratoriya Geokhimicheskikh Problem.
A. V. Kudel'skiy and M. F. Kozlov.
Minsk, Izdatel'stvo 'Nauka i Tekhnika', 1970. 144 p, 14 fig, 36 tab, 143 ref.

Descriptors: Geochemistry, Hydrogeology, *Groundwater basins, *Water chemistry, Aquifers, Organic matter, Artesian wells, Oil, Brines, Confined water, Groundwater movement, Natural resources, Natural gas, Halogens, Geologic formations.
Identifiers: USSR, *Iodine, *Bromine, Belorussia, Turkmen SSR, Country rocks, Zonality, Mineralization, *Pripyat basin (USSR), *West Turkman basin (USSR).

The results of long-term geologic and hydrogeologic investigations in regions of present-day iodine-bromine waters are examined in conjunction with the chemical composition of these waters and the geochemistry of country rocks. High concentrations of iodine were found in waters of geologic and tectonic regions which have sea deposits rich in organic carbon. These carbonaceous deposits range in thickness from 1,000 to 1,500 m or more, and are associated with sedimentary deposits as thick as 5,000 m or more. Highly concentrated iodine-bromine groundwaters were associated with artesian oil- and gas-bearing basins confined to large, deep geologic structures. The iodine and iodine-bromine waters in these basins moved in the direction of the zones of deep faults. Two unique and distinctly different artesian basins were distinguished -- the Pripyat basin in Belorussia and the West Turkmen basin in the Turkmen SSR. The iodine and bromine contents in groundwater of the Pripyat basin were extremely high--20-223.7 mg/liter and 1,125-6,407 mg/liter, respectively; the average content of iodine and bromine in groundwater of the West turkmen basin was 19-30 mg/liter and 210-215 mg/liter. Further studies are needed to corroborate the presence of definite patterns found in the formation and distribution of iodine-bromine waters in these areas. (Josefson-USGS)
W71-11770

MAJOR THERMAL SPRINGS OF UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 02F.
W71-11779

CHEMICAL QUALITY OF WATER IN SOUTHEASTERN WYOMING.
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 07C.
W71-11784

THE SPECTROFLUORIMETRIC DETERMINATION OF SULPHIDES,
Salford Univ. (England). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W71-11931

POLYCHLORINATED BIPHENYLS IN HUMAN ADIPOSE TISSUE,
Food and Drug Administration, Perrine, Fla. Div. of Pesticides.
For primary bibliographic entry see Field 05A.
W71-11935

PROCESS GAS CHROMATOGRAPHIC ANALYSIS OF LIQUIDS CONTAINING HIGH-BOILING RESIDUES OR DISSOLVED SOLIDS,
American Oil Co., Whiting, Calif; and Fullerton, Calif. Process Instruments Div. Beckman Instruments, Inc., Fullerton, Calif.
For primary bibliographic entry see Field 05A.
W71-11944

A SCHEME OF QUALITATIVE ANALYSIS FOR TWENTY COMMON CATIONS,
Allahabad Univ. (India). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W71-11951

ELECTROCHEMICAL METER FOR ACTIVITY MEASUREMENTS IN NATURAL ENVIRONMENTS,
California Univ., Berkeley. Inst. of Marine Resources and Engineering Geoscience.
Pat Wilde, and Peter W. Rodgers.
The Review of Scientific Instruments, Vol. 41, No. 3, p 356-359, March 1970. 3 fig, 1 tab, 12 ref.

Descriptors: *Electrochemistry, *Measurements, *Instrumentation, *Electronic equipment, Electrodes, Hydrogen-ion concentration, Ions.
Identifiers: Colomel cell, Operational amplifier.

An electrochemical meter designed for measurements in the marine environment but equally useful in other natural environments is described. Some features of the instrument are (1) all input channels are high impedance; (2) up to 11 reading electrodes can be monitored from one reference electrode; (3) voltages are measured with respect to solution ground; (4) a null balance circuit option; (5) an accuracy of better than 1 mV. With suitable operative ion-selective electrodes, the instrument can monitor (a) operational activities, (b) activity ratios, (c) solubility products, or (d) states of saturation. (Little-Battelle)
W71-11953

GAS-WATER CHROMATOGRAPHY AIDS WATER POLLUTION ANALYSIS.
National Bureau of Standards, Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-11956

GAS CHROMATOGRAPHIC DETERMINATION OF PARTITION COEFFICIENTS OF SOME UNSATURATED HYDROCARBONS AND THEIR DEUTERATED ISOMERS IN AQUEOUS SILVER NITRATE SOLUTIONS,
National Bureau of Standards, Washington, D.C.
S. P. Wasik, and W. Tsang.
Journal of Physical Chemistry, Vol. 74, No. 15, p 2970-2976, July 23, 1970. 6 fig, 4 tab, 21 ref.

Descriptors: *Gas chromatography, *Aqueous solutions, *Aromatic compounds, Ions, Separation techniques, Isotropy.
Identifiers: *Hydrocarbons, Olefins, Isomers, Ethylene, Benzene, Propylene, Isobutene, Toluene, Silver nitrate.

A brief description of work done at NBS on analysis of hydrocarbons present in water is given. Aqueous solutions of complexing metal ions are used as the stationary phase in GLC columns. (Little-Battelle)
W71-11957

THE THIN-LAYER CHROMATOGRAPHIC PROPERTIES OF TRACE METALS: I. SEPARA-

TION OF SOME METALS WITH SPECIAL REFERENCE TO LEAD,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W71-11963

THE THIN-LAYER CHROMATOGRAPHIC PROPERTIES OF TRACE METALS: II. SEPARATION OF SOME CATIONS ON COMMERCIALLY PRECOATED SHEETS,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W71-11964

ANALYSIS OF MULTICOMPONENT ORGANIC MIXTURES IN AQUEOUS MEDIA BY PYROLYSIS,
Rocketdyne, Canoga Park, Calif. Research Div.
For primary bibliographic entry see Field 05A.
W71-11975

USE OF AZURE A INSTEAD OF METHYLENE BLUE FOR DETERMINATION OF ANIONIC DETERGENTS IN DRINKING AND SURFACE WATERS,
Instituut voor Gezondheidstechniek TNO, Delft (Netherlands).
For primary bibliographic entry see Field 05A.
W71-11977

A KINETIC MODEL FOR THE CHEMICAL COMPOSITION OF SEA WATER,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
W. S. Broecker.
Quarternary Research, Vol 1, No 2, p 188-207, April 1971. 5 fig, 3 tab, 54 ref. AEC Contract No. AT(30-1)2663.

Descriptors: *Water chemistry, *Sea water, *Paleohydrology, Chemical reactions, Diagenesis, Equilibrium, Thermodynamics, Stable isotopes, Radioisotopes, Mineralogy, Salinity, Salts, Aqueous solutions.

Because the sediments presently accumulating in the ocean show little evidence of equilibration with the overlying water, the possibility that kinetic factors play an important role in seawater chemical history must be seriously explored. Material balance restrictions are substituted for some of the usual chemical equilibria. The role of organisms is dominant for at least some of the important components of sea salt. If the chemistry of sea water is dependent on rates of supply of individual components, the rate of vertical mixing in the sea, and the type of material formed by organisms, then substantial changes in the chemical composition have almost certainly taken place. Several means by which such changes might be reconstructed from chemical and isotopic measurements on marine sediments are suggested. (Knapp-USGS)
W71-11990

RADIOCHEMICAL ANALYSES OF WATER SAMPLES COLLECTED ON AMCHITKA ISLAND, ALASKA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05A.
W71-11993

HYDROGRAPHIC OBSERVATIONS IN TAMPA BAY AND THE ADJACENT GULF OF MEXICO, 1967,
Carl H. Saloman, and John L. Taylor.
Available from National Technical Information Service, Springfield, Va. 22151 - price, printed copy $3.00, microfiche $0.95. National Oceanic and Atmospheric Administration, National Marine Fisheries Service Data Report 55, April 1971. 54 p.

Descriptors: *Hydrologic data, *Data collections, *Water analysis, *Florida, *Gulf of Mexico, Water quality, Chemical analysis, Analytical techniques, Water properties, Surface waters, Salinity, Estuaries, Pollutant identification.
Identifiers: *Tampa Bay (Florida), *Boca Ciega Bay (Florida).

Hydrographic data for Tampa Bay, Florida and adjacent area include water temperature, salinity, total phosphorus, total Kjeldahl nitrogen, pH, dissolved oxygen, turbidity, water transparency, ultraviolet absorption, chlorophyll a,b, and c, astacin and nonastacin carotenoids, and primary productivity based on the chlorophyll a and light and dark-bottle methods. Methods of collecting and analyzing samples are described. Tables summarize data collected from 30 permanent stations by mean, range, and number of observations of samples taken daily at the laboratory dock, weekly from a small embayment in Boca Ciega Bay where pompano culture was studied, and monthly at stations where oyster raft experiments were made in Old Tampa Bay and Boca Ciega Bay. (Woodard-USGS)
W71-11994

SOLVENT ACTION OF NATURAL WATERS IN KARST REGIONS OF THE EUROPEAN USSR (Agressivnost' prirodnykh vod v Karstovykh rayonakh Yevropeyskoy chasti SSSR),
A. A. Kolodyazhnaya.
Izdatel'stvo 'Nauka', Moscow, 1970. 152 p.

Descriptors: *Geochemistry, *Water analysis, *Water chemistry, *Karst, *Geomorphology, Carbonate rocks, Chemical analysis, Groundwater Microbiology, Precipitation (Atmospheric), Vegetation effects, Surface waters, Spring waters, Salts, Acidic soils, Alkaline soils, Climatic data, Bogs, Carbon dioxide.
Identifiers: *USSR, *European USSR, Natural waters, Tectonics, Supergenesis, Anthropogenic processes, Sulfuric acid.

An analysis of the chemical action of natural waters on carbonate rocks is important for solving problems of karst formation and for evaluating the effect of natural solutions on building materials. A study was made of the natural factors which participate directly or indirectly in forming the solvent action of waters entering karstic rocks. These factors included: (1) atmospheric precipitation; (2) acidic soils; (3) alkaline soils; (4) forest areas; (5) surface- and groundwaters; (6) microbiological activity; (7) lowland and upland bogs; (8) mineral and thermal springs; (9) supergene zones of ore and other sulfide-rich mineral deposits; (10) salt losses (NaCl, MgCl 2 and Na2SO4); and (11) formation of chemically active waters by liquid, solid and gas products of industrial enterprises (anthropogenic processes). Study of the solvent properties of these waters was based on (1) on-site investigations of karst and of the chemical composition of natural solutions interacting with carbonate rocks; (2) observations of the chemical composition of atmospheric precipitation and its chemistry in the zone of aeration; and (3) laboratory tests for determining quantitative indices of solvent action of various natural solutions in their interaction with carbonate rocks. A total of 17 typical karst regions were identified in the European USSR for studying the origin of solvent components of natural waters and the patterns of karst development within various tectonic structures. (Josefson-USGS)
W71-12019

ARSENIC AND LEAD IN WATER - A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05B.
W71-12036

A FIELD METHOD FOR DETERMINATION OF ANION-ACTIVE SURFACTANTS IN WATER,
Institute of General and Municipal Hygiene, Moscow (USSR).
E. A. Mozhaev, Yu. V. Lin'kov, and L. M. Kapyrina.
Hygiene and Sanitation, (Russian Translation), Vol 34, No 10, p 87-90, October 1969.

Descriptors: *Water analysis, *Surfactants, Water quality control, Separation techniques, Analytical techniques, Colorimetry, Acid, Hydrogen ion concentration, Absorption.
Identifiers: *Methylene blue, *Buffer, Chloroform.

The cumbersome equipment and excessive time required to perform tests for anion-active surfactants in the laboratory has precluded that test from being used in the field and initiated development of a test procedure which can be conviently used. The method is based on the following procedure: cation-active methylene blue is reacted with the anion-active surfactant in the presence of an alkaline buffer solution to form a blue-colored complex. This complex is extracted from the aqueous mixture with chloroform and washed with an acid solution of methylene blue. Extraction with chloroform is performed several times. The washing with an acid solution of methylene blue eliminates interference by proteins and several salts, while interference by sulfides is eliminated by preliminary processing of the sample with hydrogen peroxide. For handling ease, the procedure was modified to allow the entire operation to proceed in a 20 ml test tube. All reagents were prepared so that one ml of each is required of hydrogen peroxide, phosphate buffer solution, neutral methylene blue, and sulfuric acid. After mixing the chloroform layer separates on standing and the colorimetric determination is made after 5 minutes of standing by comparison with test tubes of known concentration treated in the same manner. The entire process consumes only 10 min., but may be in error by as much as 50%, since not all surfactants behave similarly. (Lowry-Texas)
W71-12044

THE NITRATE DILEMMA.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.

Cross Section, Vol 16, No 6, June 1970, p 1, 3-4. 3 fig.

Descriptors: *Nitrogen compounds, *Pollution identification, *Water quality, *Monitoring, *Groundwater, Nitrate, Nitrites, Nitrogen-cycle, History, Soil analysis, Water transfer, Irrigation practices, Leaching, Texas.
Identifiers: *Ogallala aquifer, High Plains (Texas), Parmer County (Texas), Holly Sugar Studies.

The High Plains Underground Water Conservation District and the Texas Water Development Board have a continuing program for monitoring water quality in the Ogallala aquifer to: (1) appraise groundwater for the landowner, (2) establish regional water quality, and (3) develop a historical data base. Soil analysis, water importation, and industrial development require the collection of such data. There is no evidence that nitrate, nitrite, or any other nitrogen-cycle elements are prevalent water polluters in the High Plains area. The average nitrate content was 7.1 parts per million (ppm) for 99 water samples collected in 1965, and 6.8 ppm for 86 samples collected in 1968 in Parmer County. Changes in nitrate content of all the comparable samples were within the range of error analysis and methods of collection. Groundwater in Parmer County is low in nitrates, and is not affected by high density farming and fertilization practices, although farmers in the area use more nitrogen fertilizer and irrigation than in the past. Plants use 70% of the applied nitrogen; anaerobic soil bacteria and/or deep seepage may account for 30%. The Holly Sugar Studies indicate that nitrogen is stored in soil. Nitrogen-migration research is needed particularly for imported surface water

transfer, over irrigation and leaching. (Popkin-Arizona)
W71-12122

2L. Estuaries

A STUDY OF SUBMERGED DREDGE HOLES IN NEW JERSEY ESTUARIES WITH RESPECT TO THEIR FITNESS AS FINFISH HABITAT,
New Jersey Dept. of Conservation and Economic Development, Trenton. Nacote Creek Research Station.
For primary bibliographic entry see Field 06G.
W71-11649

INFLUENCE OF SALINITY AND TEMPERATURE ON THE ACCUMULATION OF CESIUM-137 BY AN ESTUARINE CLAM UNDER LABORATORY CONDITIONS,
Bureau of Commercial Fisheries, Beaufort, N.C. Radiobiological Lab.
For primary bibliographic entry see Field 05C.
W71-11670

AUTOMATED NUTRIENT ANALYSES IN OCEANOGRAPHY,
Coast Guard, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 05A.
W71-11691

MORTALITY OF ESTUARINE ANIMALS DUE TO COLD ON THE GEORGIA COAST,
Georgia Univ., Sapelo Island. Marine Inst; and Georgia Univ., Athens. School of Veterinary Medicine.
For primary bibliographic entry see Field 05B.
W71-11721

ORIGIN OF MAJOR CYCLICITY OF EVAPORITIES AND BITUMINOUS ROCKS: AN ACTUALISTIC MODEL,
Leiden Rijksuniversiteit (Netherlands). Inst. of Geology and Mineralogy.
M. Brongersma-Sanders.
Marine Geology, Vol 11, No 2, p 123-144, September 1971. 5 fig, 1 tab, 61 ref.

Descriptors: *Sedimentation, *Saline water systems, *Bituminous materials, *Salts, Chemical precipitation, Deposition (Sediments), Water chemistry, Water circulation, Lagoons, Estuaries, Estuarine environment.
Identifiers: *Evaporitics.

Cyclic changes in basin depth can occur in evaporite basin with a constant rate of subsidence intermediate between the slow rate of pre-evaporitic and the high rate of halite sedimentation. In a basin located in the arid parts of the trade-wind belt with the entrance area downwind, the cyclic changes in depth result in cyclic changes in the hydrological regime. The wind-driven quasi-estuarine circulation, which prevails in the pre-evaporite phase over the whole basin as long as the depth is small, gives way to an anti-estuarine circulation when the depth becomes great, but keeps predominance over the sill. This combination provides a mechanism which leads to high salinities, since it prevents and outflow of highly saline water. After a rapid shoaling in the halite phase, the wind-drift regains predominance over the whole basin, with a decrease in salinity. Upwelling rakes or dissipates the thermocline, causing extreme fertility, which favors anoxic conditions and deposition of bituminous sediments. In this way the frequent association of evaporites with bituminous rocks develops. In a basin bituminous sediments are deposited in the pre-evaporite phase when the quasi-estuarine circulation dominates; the black colors tend to disappear when the anti-estuarine circulation gains predominance and evaporites are being precipitated. (Knapp-USGS)
W71-11731

ANIMAL-SEDIMENT RELATIONS IN SHALLOW WATER BENTHIC COMMUNITIES,
Chicago Univ., Ill. Dept. of Geophysical Sciences.
For primary bibliographic entry see Field 05C.
W71-11732

THE MAGNETIC ANISOTROPY OF SAMPLES FROM THE DEEP SEA DRILLING PROJECT LEG 1, ORANGE, TEXAS TO HOBOKEN, N. J.,
Southampton Univ. (England). Dept. of Oceanography.
A. I. Rees.
Marine Geology, Vol 11, No 2, p M16-M23, September 1971. 5 fig. 7 ref.

Descriptors: *Petrofabrics, *Sedimentary structures, *Bottom sediments, *Anisotropy, *Magnetic studies, Sediments, Stratigraphy, Structural geology.
Identifiers: *Isotropy (Magnetic).

Magnetic fabric measurements were made on 53 specimens from four drill holes. Ten specimens, of deep sea clay, had no significant magnetic fabric. Of the remainder, 19 were deformed, probably during drilling, and 24 retained in situ fabric. The results support the view that the chevron folding seen in one core took place before the sediments became compacted and is probably due to small scale lateral movements of near surface material. (Knapp-USGS)
W71-11734

PYROPHYLLITE AND TALC IN WATERS OFF THE SOUTHEASTERN UNITED STATES,
Smithsonian Institution, Washington, D.C. Div. of Sedimentology.
For primary bibliographic entry see Field 05B.
W71-11735

STATISTICAL CHARACTERISTICS OF VELOCITY FLUCTUATIONS AT INTERMEDIATE SCALES IN A COASTAL PLAIN ESTUARY,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Oceanographic Labs.
Glenn A. Cannon.
Journal of Geophysical Research, Vol 76, No 24, p 5852-5858, August 20, 1971. 5 fig, 15 ref. Contracts Nonr 4010 (11) and 477 (37)ONR.

Descriptors: *Currents (Water), *Estuaries, *Current meters, Tides, Water circulation, Velocity, Data collections, Seiches, Tidal effects, Instrumentation, Frequency analysis, Hydrography, Statistics, Statistical methods, Coastal plain, Data processing, Maryland.
Identifiers: Patuxent River.

Motion at intermediate scales was measured in a coastal plain estuary with four propeller current meters, each consisting of two propellers mounted one above the other at right angles. Three runs were made with the current meters arranged in a longitudinal, a vertical, and a lateral array, respectively. Data were recorded every 10 sec for 50 hours during each run. During the longitudinal run, spectra of kinetic-energy density of the components of horizontal velocity were similar over distances of 500 meters. The spectra could be satisfactorily represented in two frequency bands by straight lines (on log-log plots) with a -5/3 slope. Between the two bands with -5/3 slopes there was a two fold increase in the energy-density level in both velocity components. The natural period, about 7.5 min, for cross-channel seiching occurred in the same interval. During the vertical run, spectra in a region of large vertical shear in the average current had a frequency band with a slope of -1. These spectra had a roughly -5/3 slope at higher frequencies. During the lateral run, the spectra were observed to have comparable energy density in both velocity components. Significant time changes in the spectra were observed during a 2-week field experiment.
W71-11742

BOTTOM CURRENTS ON THE NEW ENGLAND CONTINENTAL RISE,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 02J.
W71-11743

DISTRIBUTION OF PARTICULATE ALUMINUM IN THE GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W71-11745

EXPERIMENTAL EROSION OF CALCAREOUS OOZE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 02J.
W71-11746

FLUSHING OF THE GERARD-EWING LARGE-VOLUME WATER SAMPLER,
Heidelberg Univ. (West Germany). Physikalisches Instiut (II).
For primary bibliographic entry see Field 07B.
W71-11747

TRACE MATERIALS IN WASTES DISPOSED TO COASTAL WATERS-FATES, MECHANISMS AND ECOLOGICAL GUIDANCE AND CONTROL,
Federal Water Quality Administration, Corvallis, Oreg. National Coastal Research Program.
For primary bibliographic entry see Field 05B.
W71-11793

ESTUARINES, BAYS, AND COASTAL CURRENTS AROUND PUERTO RICO,
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
For primary bibliographic entry see Field 08A.
W71-11866

STORM SURGE ON THE OPEN COAST: FUNDAMENTALS AND SIMPLIFIED PREDICTION,
Coastal Engineering Research Center, Wash. D.C.
R. R. Bodine.
Technical Memorandum No 35, May 1971. 65 p, 36 ref.

Descriptors: *Surges, *Hurricanes, *Coastal engineering, *Mathematical models, *Computer programs.
Identifiers: Chesapeake Bay entrance.

A quasi-two-dimensional numerical model for open-coast storm-surge computations is discussed from the standpoint of underlying asumptions, range of validity, calibration, and application. While it is possible to make computations manually, electronic digital calculations are generally preferred. Elementary aspects of hurricanes and the physical factors of storm-generation processes are discussed. The basic hydrodynamic equations are given, together with the assumptions generally made in their development. The equations consistent with the model are reduced forms of the basic equations in which several terms have been neglected. These omissions are indicated, and their effects on the resulting numerical scheme are discussed. The use of design hurricanes for engineering studies is treated. Effects of astronomical tide, initial water level, and atmospheric-pressure setup are considered. A problem is solved for the Chesapeake Bay Entrance by computer and manually. The computer program used is listed.
W71-11874

COMPARISON OF THE POLLUTED HOOGHLY ESTUARY WITH THE UNPOLLUTED MATLAH ESTUARY, INDIA,
Central Inland Fisheries Research Inst., Barrackpore (India).
For primary bibliographic entry see Field 05C.
W71-11876

DISTRIBUTION OF EARLY DEVELOPMENTAL STAGES OF PINK SHRIMP, PENAEUS DUORARUM, IN FLORIDA WATERS,
Miami University, Fla. Rosenstiel School of Marine and Atmospheric Sciences.
Albert C. Jones, Dolores E. Dimitriou, Joseph J. Ewald, and John H. Tweedy.
Bulletin of Marine Science, Vol 20, No 3, p 634-661, 1970. 12 fig, 9 tab, 28 ref.

Descriptors: *Shrimp, *Distribution patterns, *Spawning, Florida, Larvae, Plankton, Sea water, Sampling.
Identifiers: Florida Bay, Tortugas Shelf (Florida), Discovery net.

This study is based on 2781 plankton samples collected by a 'Discovery'-type net in Florida Bay and on the Tortugas Shelf on monthly cruises from January 1955 to June 1962. Protozoeae and myses larvae were distributed on the shelf mainly between 8 and 30 fathoms. Postlarvae were found both on the shelf and also in the shallower waters of Florida Bay. Older post larvae were restricted almost entirely to inshore waters. Pink shrimp spawned throughout the year, but at a lower intensity in winter. The temperature observed for spawning extended from 19.6 to 30 C. The seasonal and year-to-year fluctuations in the relative abundance of larve were related generally to temperature, with some unexplained short-term fluctuations. The larvae migrate vertically in the water in a daily cycle. Most of the shrimp were at the bottom during the day with an increased number at the surface and in mid-water at night. Young larvae were more often at the bottom and the older postlarvae were more often taken in surface tows. (Mortland-Battelle)
W71-11927

A SCREENING TECHNIQUE FOR ESTIMATING COPPER TOXICITY TO ESTUARINE PHYTOPLANKTON,
Federal Water Quality Administration, West Kingston, R.I. National Marine Water Quality Lab.
For primary bibliographic entry see Field 05C.
W71-11955

DELAWARE ESTUARY AND BAY WATER QUALITY SAMPLING AND MATHEMATICAL MODELING PROJECT.
Delaware River Basin Commission, Trenton, N.J.
For primary bibliographic entry see Field 05A.
W71-11968

HYDROGRAPHIC OBSERVATIONS IN TAMPA BAY AND THE ADJACENT GULF OF MEXICO, 1967,
For primary bibliographic entry see Field 02K.
W71-11994

ESTUARINE STUDIES,
Geological Survey, Philadelphia, Pa.
For primary bibliographic entry see Field 07B.
W71-12005

REMOTE SENSING OF MARSHLANDS AND ESTUARIES USING COLOR INFRARED PHOTOGRAPHY,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07B.
W71-12007

RESULTS OF REMOTE-SENSING TESTS FOR OCEANOGRAPHY AT TEXAS A AND M UNIVERSITY,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 07B.
W71-12015

HYDROBIOLOGY, 'BIORESOURCES OF SHALLOW WATER ENVIRONMENTS'.
For primary bibliographic entry see Field 07B.
W71-12029

REDUCED FLOWS AND THE FUTURE ECOLOGY OF THE SAN FRANCISCO BAY-DELTA SYSTEM,
California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 05B.
W71-12030

REMOTE SENSING OF COASTAL ENVIRONMENTS USING MULTISPECTRAL PHOTOGRAPHIC TECHNIQUES,
Long Island Univ., Greenvale, N.Y.
For primary bibliographic entry see Field 07B.
W71-12033

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DESALTING SALINE WATER FOR IRRIGATION--A CASE STUDY, COACHELLA AREA, CALIFORNIA,
Bureau of Reclamation, Boulder City, Nev. Hydrology Branch.
E. S. Krous, J. P. Wagner, H. L. Parkinson, and M. S. Sachs.
Water Resources Bulletin, Vol 7, No 4, p 810-822, August 1971. 8 fig, 4 tab, 15 ref.

Descriptors: *Irrigation water, *Water sources, *Desalination, *California, Distillation, Membrane processes, Soil-water-plant relationships, Irrigation practices, Cost-benefit analysis, Salinity, Water resources development, Water management (Applied), Conjunctive use, Water costs.
Identifiers: Coachella (Calif).

A case study was performed to evaluate potential applications of desalted saline water for agriculture using 2 distillation type processes and 2 membrane type processes. The Investigation determined the costs and benefits associated with desalting saline water at concentrations of 1,500, 900, 400, 200, and 50 ppm. Benefits from desalting are generated by shifts to more profitable crops, reduced costs for drainage, and reduction in fertilizer and labor requirements with better quality water. Costs are based on the project features such as desalting plants, raw water diversion facilities, and storage reservoirs, conveyance and distribution systems, brine disposal, blending facilities, and gypsum addition systems. Hydrologic studies determined the crop irrigation requirements, water and demand schedules, desalted water storage requirements, brine disposal requirements, and size of facilities required. Reconnaissance design layouts were made for producing desalted water using a combination of 14 schemes. The study also included a review of irrigation practices. The cost-benefit ratios ranged from 0.4 to 1.0 for 1,550 ppm irrigation water to 0.8 to 1.0 for 50 and 200 ppm water. Investment costs per acre are high, ranging from $12,900 to $20,900. Irrigation benefits are based on the increase production from a desert condition with no water supply to the irrigation conditions studied. (Knapp-USGS)
W71-11737

SECOND ANNUAL REPORT - OPERATION OF THE MULTI-STAGE FLASH DISTILLATION PLANT SAN DIEGO, CALIFORNIA.
Catalytic Construction Co., Philadelphia, Pa.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $2.50. Office of Saline Water Research and Development Progress Report No. 645, Mar 1971, 296 p, 107 fig, 8 append. OSW Contract 14-01-0001-2251.

Descriptors: *Operations and maintenance, Management, *Flash distillation, *Desalination, plants, Desalination equipment, Heat exchangers, Pumps, Corrosion, Water treatment, Deaeration, Evaporators, Operating costs, Design, Scaling, Desalination, Sea water.

The general discussion concerns the management, operation, maintenance, physical plant, and information gained in the overall program of advancing the state of the art of desalting technology. The plant is a 2,500,000 gallon per day full size module of a 50,000,000 gallon per day multi-stage flash sea water desalination plant. The module is operated in conjunction with a utility electric power plant. The plant is designed to provide meaningful data concerning the design and operation of large desalination plants including such items as heat transfer, equipment and structural design, materials, cost of providing fresh water, process engineering, operation of multipurpose plants, and equipment performance. (Lohman-OSW)
W71-11869

OPERATION OF THE MULTI - EFFECT MULTI-STAGE FLASH DISTILLATION PLANT (CLAIR ENGLE), FOURTH REPORT (SEMI-ANNUAL), SAN DIEGO, CALIFORNIA.
Catalytic Construction Co., Philadelphia, Pa.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $2.00. Office of Saline Water Research and Development Progress Report No. 666, April 1971. 219 p, 71 fig, 30 tab, 2 append. OSW Contract 14-30-2651.

Descriptors: *Operations and maintenance, Management, *Flash distillation, *Desalination plants, Desalination equipment, Heat exchangers, Pumps, Corrosion, Water treatment, Deaeration, Evaporators, Operating costs, Design, Scaling, *Treatment facilities, Desalination, Sea water.
Identifiers: High temperature operations.

The general discussion concerns the management, operation, maintenance, physical plant, and information gained in the overall program of advancing the state of the art of desalting technology. The plant is a 1,000,000 gallon per day, high performance, sea water desalination plant. The plant is designed to provide meaningful data concerning the design and operation of large desalination plants including such items as heat transfer, equipment and structural design, materials, cost of providing fresh water, process engineering including high temperature operation, operation of multi purpose plants, and equipment performance. (Lohman-OSW)
W71-11870

PERFORMANCE CHARACTERISTICS OF ADVANCED EVAPORATOR TUBES FOR LONG-TUBE VERTICAL EVAPORATORS,
Oak Ridge National Lab., Tenn. Nuclear Desalination program.
L. G. Alexander, and H. W. Hoffman.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $4.00. Office of Saline Water Research and Development Progress Report No 644, Jan 1971. 356 p, 189 fig, 10 tab, 72 ref, 2 append. OSW Contract 14-30-2535.

Descriptors: Boiling, *Dropwise condensation, *Condensation, *Evaporation, Wetting, Flow, *Heat transfer, *Distillation processes, *Evaporators, Experimental data, Foaming, Porous media, *Tubes.
Identifiers: *Vertical tube evaporators, *Heat transfer coefficient, Evaporator-condenser tubes, Extended heat transfer surface, Film evaporation, Film condensation, Foam evaporation, Corrugated tubes, Doubly-fluted tubes.

Smooth tubes used in conventional vertical tube evaporators have overall heat-transfer coefficients of the order of 500-600 Btu/hr.sq ft. F. In contrast, tubes with surfaces modified in various ways to promote condensation and/or evaporation exhibit overall coefficients up to seven times larger than those of smooth tubes. This report details investigations undertaken to compare the effectiveness of enhanced tubes for VTE service. Results for a wide variety of modified tubes are given with emphasis on the performance of doubly fluted, spirally corrugated, and porous-surfaced tubes as most promising types. In addition, means for achieving increased heat transfer through modification of surface and/or flow are considered; limited experiments elucidating the enhancement mechanisms are also described. (Galowin-OSW)
W71-11871

RENDERING DESALINATED WATER POTABLE,
Scientific Research Inst. of Water Transport Hygiene, Moscow (USSR).
L. I. El'piner, and Yu. B. Shafirov.
Hygiene and Sanitation (Russian Translation), Vol 34, No. 10, p 21-28, October, 1969, 3 fig, 3 tab, 9 ref.

Descriptors: *Desalination processes, *Distillation, *Organoleptic properties, Taste, Potable water, Demineralization, Water treatment, Public health, Automatic controls, Neutralization, Carbonates, Calcium, Sodium, Design criteria, Sampling, Water analysis, Analytical techniques.
Identifiers: *Mineralization.

Numerous studies have indicated that consumption of distilled water alone has resulted in various disorders in the electrochemical balances of the body. For seagoing vessels, distillation of sea water may be the most economical means of supplying fresh water to the crew. Therefore, a review was made of the existing literature concerning the mineral content of natural waters. It was determined that Moscow tap water approached the optimal mineral content, and the records of the Moscow water works were examined to determine exactly which mineral constituents were present and at what concentration. Technical difficulties in supplying minerals to the distilled water resulted in several deviations from the recorded tap water concentrations, but the water was of essentially the same class. Ship board testing of sailors was extensively conducted, using the mineralizate for both drinking and food preparation with no ill effects. Automation of the mineralization was easily accomplished, and with the technical and economic feasibility well established, its general use was recommended. (Lowry-Texas)
W71-12041

DESALTING TECHNOLOGY IN POLLUTION-CONTROL PROBLEMS,
Reading and Bates Offshore Drilling Co., Tulsa, Okla.
K. G. Young.
Journal of the American Water Works Association, Vol 63, No 1, p 21-24, January 1971. 5 fig, 10 ref.

Descriptors: *Waste water treatment, *Semipermeable membranes, *Desalination processes, Flash distillation, Vapor compression distillation, Reverse osmosis, Electrodialysis, Scaling, Economic feasibility, Desalination, Osmosis.
Identifiers: Multi-stage flash distillation, Multiple effect distillation.

As natural sources of fresh water are depleted and as the volume of liquid wastes and their disposal problems increase, the economic and resource conservation benefits related to the complete recovery of pure water from saline or contaminated sources become increasingly favorable. Three proposed procedures to resolve pollution problems are outlined with emphasis placed on economic considerations. These same economic standards are applied to desalting methods which in recent years have improved their feasibility, and thus their utility. Several desalting methods currently in commercial use or being developed are briefly reviewed. Four principle methods are: distillation, deionization by membranes, salt separation by freezing, and chemical deionization; however, since the latter two methods have definite performance limitations in pollution control application, broader descriptions of distillation and deionization by membranes are presented. The Multi-stage flash, Multiple effect, and Vapor compression distillation processes, all of which employ some type of regenerative thermal cycle and reverse osmosis and electrodialysis (membrane methods) are dealt with in greater detail. Desalting techniques described seem certain to play an ever-increasing part in providing practical and economical solutions to pollution-control problems involving waste water. (Brudette-Texas)
W71-12058

RECENT DEVELOPMENTS IN WATER DESALINATION,
National Inst. for Water Research, Johannesburg (South Africa).
G. J. Stander, S. G. Wiechers, and G. L. Dalton.
South African Journal of Science, Vol 67, No 3, p 86-99, March 1971. 11 fig, 1 tab.

Descriptors: *Desalination processes, *Economic feasibility, *Dual purpose, *Demineralization, *Flash distillation, Reverse osmosis, Dialysis, Freezing, Ion exchange, Electric power production, Cost analysis, Cost comparison.
Identifiers: *South Africa, Piezodialysis.

Recent advances in desalination have improved its economic feasibility and there are indications that it will become a reality in South Africa within 10-20 years. Although seawater desalting may become important in coastal regions, desalination will play its greastest role in water reuse, utilization of mineralized underground water in arid and semiarid areas and in the prevention of pollution of fresh water resources by mineralized effluents. Those desalination processes currently economically feasible are described, cost structures and constraints are reviewed and possible approaches to cost reduction are considered. Saline water conversion processes may be divided into 2 categories: processes that separate water from the saline solution, and processes that separate salt from the solution. The processes discussed in the water-separating category are multistage flash evaporation, direct, indirect and vacuum freezing processes and reverse osmosis; electrodialysis, piezodialysis and weak ion-exchange resins are the salt separating processes. It is concluded that the most attractive technique for large-scale desalination still remains the conventional multistage multiflash distillation process. This will remain true for some time to come, particularly in view of the trend toward dual purpose installations, e.g., the integrated production of fresh water and electric power. All present dual purpose plants are based on distillation processes and fossil fuels, but future plants may conceivably use nuclear fuels. A distillation plant cost reduction method is pretreatment by softening and desulphation prior to evaporation, which together with acidification enables the evaporators to be run at higher and more economical temperatures. Additionally, recovery and sale of the salts may also reduce operating costs. (Casey-Arizona)
W71-12143

DESIGN CONSIDERATIONS FOR TREATMENT OF SOLIDS-LADEN WASTE WATERS BY REVERSE OSMOSIS,
Environgenics Co., El Monte, Calif.
For primary bibliographic entry see Field 05D.
W71-12232

NEW ION EXCHANGE SYSTEMS FOR TREATING MUNICIPAL AND DOMESTIC WASTE EFFLUENTS,
Rohm and Haas Co., Philadelphia, Pa.
For primary bibliographic entry see Field 05D.
W71-12233

3B. Water Yield Improvement

WATER RESOURCES RESEARCH AND CALIFORNIA'S FUTURE.
California Univ., Los Angeles, Water Resources Center.
For primary bibliographic entry see Field 06D.
W71-11788

WATER-RESOURCES INVENTORY, SPRING 1969 TO SPRING 1970, ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02G.
W71-11992

3C. Use of Water of Impaired Quality

THE FEASIBILITY OF IRRIGATING SOFTWOOD AND HARDWOOD FOR DISPOSAL OF PAPERMILL EFFLUENT,
Louisiana Tech. Univ., Ruston. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W71-11644

INSECTICIDE ADSORPTION ON ACTIVATED CARBON,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05A.
W71-11723

INCREASING THE AGRICULTURAL USE OF SALINE WATER BY MEANS OF TRICKLE IRRIGATION,
Hebrew Univ., Rehovoth (Israel). Dept. of Irrigation.
D. Goldberg, B. Gornat, M. Shmueli, I. Ben-Asher, and M. Rinot.
Water Resources Bulletin, Vol 7, No 4, p 802-809, August 1971. 5 fig, 6 tab, 8 ref.

Descriptors: *Irrigation systems, *Irrigation efficiency, *Crop response, *Saline water, Soil-water-plant relationships, Water quality, Arid lands.
Identifiers: *Trickle irrigation.

A study was conducted in two arid zones in Israel to determine the effect of saline water applied to various crops growing in coarse-textured soil, using trickle irrigation. The test crops responded favorably in terms of plant development and yield. The method provides the possibility of raising the permissible salinity level of irrigation water and thus to increase the water reserves suitable for agricultural use in the world. The experiments were conducted in tow arid regions with saline water sources. The first is the Arava near the Gulf of Aquaba, and the second is the El-Arish district in the northern part of the Sinai desert. In general, the Arava soils are finer textured and more saline than those at El-Arish. The water contains more sulphates, and the climate is very hot and dry. In the El-Arish district, the soil is very sandy, and its salinity is low. However, the water is highly saline, and the chlorine content is also high. The yield from trickling in the Arava was double that obtained by sprinkling, and at El-Arish it was 70% greater. For tomatoes in the Arava, the yield by trickling was 66% greater than that achieved by

sprinkling, and at El-Arish it was 161% greater. (Knapp-USGS)
W71-11736

3D. Conservation in Domestic and Municipal Use

AN ANALYSIS OF MUNICIPAL WATER DEMAND IN THE PHOENIX METROPOLITAN AREA,
Arizona State Univ., Tempe. Coll. of Business Administration.
For primary bibliographic entry see Field 06D.
W71-12114

SOME RECENT DEVELOPMENTS IN THE SEARCH FOR SOLUTIONS TO CALIFORNIA'S WATER SUPPLY PROBLEMS,
Birbeck Coll., London (England). Dept. of Geography.
For primary bibliographic entry see Field 04A.
W71-12128

3F. Conservation in Agriculture

INCREASING THE AGRICULTURAL USE OF SALINE WATER BY MEANS OF TRICKLE IRRIGATION,
Hebrew Univ., Rehovoth (Israel). Dept. of Irrigation.
For primary bibliographic entry see Field 03C.
W71-11736

DESALTING SALINE WATER FOR IRRIGATION--A CASE STUDY, COACHELLA AREA, CALIFORNIA,
Bureau of Reclamation, Boulder City, Nev. Hydrology Branch.
For primary bibliographic entry see Field 03A.
W71-11737

GROUND-WATER PUMPAGE AND RELATED EFFECTS, SOUTHWESTERN LOUISIANA, 1970, WITH A SECTION ON SURFACE-WATER WITHDRAWALS,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 04B.
W71-11790

AQUACULTURE LEASE GUIDELINES.
For primary bibliographic entry see Field 06E.
W71-11891

FLORIDA AQUACULTURE LEASE LAW.
For primary bibliographic entry see Field 06E.
W71-11892

RELATIVE IMPORTANCE OF WATER AND SOIL IN THE INDIRECT RADIOCAESIUM AND RADIOCOBALT CONTAMINATION OF IRRIGATED RICE FIELDS (Importance relative de l'eau et du sol dans la contamination indirecte en radiocesium et radiocobalt des rizieres irriguees),
European Atomic Energy Community, Ispra (Italy). Center of General Research; Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
For primary bibliographic entry see Field 05B.
W71-11979

THE LACHISCH AND BESOR REGIONAL SETTLEMENT SCHEMES AS MODELS FOR AGRICULTURAL DEVELOPMENT IN ISRAEL,
State Univ. of New York, Buffalo. Dept. of Geography.
J. S. Haupert.
Proceedings, Association of American Geographers, Vol. 3, p. 70-75, 1971. 2 fig, 10 ref.

Descriptors: *Regional analysis, *Arid lands, *Rural areas, *Rural sociology, *Land use, Crops, Social aspects, Dew.
Identifiers: *Israel, *Negev Desert.

Israel has more arable land than water available for irrigation. The Negev Desert comprises 60% of the national land area while only 8% of the population lives there. Although some mining and associated industries are located in the Negev, the agricultural development of the region is a main goal. In the northern and northeastern parts of the desert the high moisture-retaining properties of the loess soils permit productive dryland grain farming despite an irregular annual rainfall of 6-10 inches, even though 75% of the total national water supply is consumed by irrigation. The national need to develop this area has led to the establishment of five regional agricultural settlement projects with integrated regional development plans. The economic and social problems in the development of two of these desert settlements are discussed in detail. (Casey-Arizona)
W71-12100

EASTLAND COURT HEARS WHITAKER CASE.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 06E.
W71-12102

THE HYDRAULICS OF AN AUTOMATED FURROW IRRIGATION SYSTEM WITH RECTANGULAR SIDE WEIR OUTLETS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
J. M. Sweeten, and J. E. Garton.
Transactions of the ASAE, Vol 13, No 6, p 746-751, 1970, Paper No 69-201. 12 fig, 1 tab, 18 equations, 17 ref.

Descriptors: *Hydraulics, *Irrigation systems, *Weirs, *Automatic control, *Surface irrigation, Furrows, Regulation, Diversion structures, Distribution systems, Energy losses, Evaluation, Design, Construction, Measurement, Head loss, Operations, Costs, Roughness coefficient, Mannings Equation, Profiles, Stage-Discharge relations, Water levels, Equations, Analysis, Energy equation, Continuity equation, Discharge measurement, Discharge coefficients, Uniform flow, Limiting factors.
Identifiers: Geometry.

A brief review of automatic surface irrigation systems is presented in terms of characteristics, requirements, regulation, diversion, distribution, and energy loss. Experiments were performed to evaluate the design of automatic systems utilizing side weirs. Side-weir advantages include self-priming discharge, construction simplicity, precise metering, adaptability, and low operating heads and costs. Objectives of these experiments were to determine discharge and roughness characteristics, to develop water-surface-profile predictive equations, and to determine effects of weir geometry on water distribution uniformity. Theory of analysis is based on the Bernoulli energy equation, the continuity principle, a side weir discharge equation, and a uniform formula for energy loss. Discharges and water surface profiles from rectangular side weirs can be accurately predicted. Average value of Manning's roughness coefficient was 0.0132. Uniform irrigation can be maintained by geometric consideration. Numerous figures and equations are presented. (Popkin-Arizona)
W71-12105

EDUCATION FOR ADULTS,
Food and Agriculture Organization of the United Nations, Rome (Italy). Rural Institutions Div.
Z. Behravesh.
In Arid Lands In Transition, Publication No. 90, AAAS, p 203-214, 1970. 5 fig.

Descriptors: *Education, *Arid lands, *Social aspects.
Identifiers: *Agricultural extension services, *Developing nations.

Agricultural production is a major source of income in most arid and semiarid regions. Improved farming practices and techniques are critically important in arid regions of underdeveloped countries. They are important not only as improved production methods but also as techniques replacing a variety of mismanagement methods which lead to soil erosion, decreasing fertility and inefficient use of the existing low water resources. The only avenue through which modern methods may be introduced is education. This means education of both young and old, since developings lands cannot afford to wait until the older generation is replaced by a more educated younger generation. Probably the best adult education methods for the areas would be through well-trained agricultural extension service teachers. The training and retention of such people is not easy because of the difficult and often primitive conditions under which they must work. For this reason they should be recruited from the area in which they will work. The conservatism and traditionalism of older people will offer barriers to adult education, but it is not an insurmountable problem. (Casey-Arizona)
W71-12106

RECOVERING AGRICULTURAL WATER, A LOCAL APPROACH.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.

Cross Section, Vol 16, No 4, April 1970, p 1-2, 4. 1 fig, 2 ref.

Descriptors: *Tailwater, *Reclamation, *Irrigation water, *Control systems, Irrigation practices, Irrigation programs, Agriculture, Economics, Groundwater, Texas, Waste water (Pollution), Recirculated water, Water table, Demonstration farms, Administration, On-site laboratories, *Water conservation.
Identifiers: *Educational campaigns, *Ogallala aquifer, Underground Water Conservation District Enabling Act.

Environmental conservation of air and water are discussed in terms of the area's economy based on water-conservation practices applied to the Ogallala aquifer. The local approach to water conservation in Texas was delineated by the Underground Water Conservation Districts Enabling Act (Article 7880-3c Vernon's Civil Statutes of Texas). The law provides for the creation of groundwater conservation districts to prevent waste in irrigation. Tailwater abatement is sought by extensive educational compaigns by means of field demonstrations of the graduated stake and sign to measure tailwater waste. Tailwater recirculation systems, with the help of irrigators, indicate this to be an economical and workable abatement method. There were about 1,000 tailwater and recirculation systems in the 4 county district area in 1968, which reclaimed more than 86,000 acre feet of tailwater. About one-half year's irrigation supply was conserved over the last 8 years. An average cumulative water-table decline rate is analyzed in terms of tailwater recovery. (Popkin-Arizona)
W71-12110

EVAPORATION FROM RICE AT GRIFFITH, NEW SOUTH WALES,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
For primary bibliographic entry see Field 02D.
W71-12113

ECONOMIC ANALYSIS OF IRRIGATION IN SUBHUMID CLIMATE,
Montana State Univ., Bozeman. Dept. of Economics; and Montana State Univ., Bozeman. Dept. of Agricultural Economics.
O. R. Burt, and M. S. Stauber.

American Journal of Agricultural Economics, Vol 53, No 1, p 33-46, February 1971. 2 fig, 5 tab, 21 ref.

Descriptors: *Subhumid climates, *Economic prediction, *Model studies, *Irrigation efficiency, *Crop response, Theoretical analysis, Stochastic processes, Markov processes, Precipitation (Atmospheric), Estimating equations, Decision making, Marginal productivity, Dynamic programming, Corn.
Identifiers: *State variables.

Irrigation in relatively high precipitation areas is a production intensification process which usually increases the marginal productivity of water. Unlike the large reclamation projects of arid regions, irrigation developments in subhumid areas are dominated by individual farms or relatively small community developments, and most investment decisions will be made in the private sector. An investment can be defined with 3 variables to which funds are devoted: water storage capacity, distribution capacity, and acres developed for irrigation. In making an economic analysis of irrigation, optimal irrigation policies must be derived. Net cash flow must then be defined as an expected value method for optimal intraseasonal water management. The problem of temporal water allocation is complicated by the increased importance of random precipitation. The most appropriate method of handling this stochastic process is by dynamic programming with a general Markovian dependence requirement placed on the criterion function. In developing the mathematical model, the simplifying assumption is made that storage reservoir additions during the irrigation season are negligible. The decision process is determined by the algebraic form of the crop production function. The model is applied to conditions prevalent for irrigated corn crops in Central Missouri. (Casey-Arizona)
W71-12116

DISTRICT PRESENTS STATEMENT BEFORE THE TEXAS WATER RESOURCES STUDY COMMITTEE.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 06E.
W71-12118

EASTLAND COURT RULES FOR WHITAKER.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.

The Cross Section, Vol 16, No 7, July 1970, p 1, 4. 2 fig.

Descriptors: *Water law, *Riparian rights, *Water wells, *Decision making, *Groundwater, Texas, Flooding, Water pressure.
Identifiers: *Ogallala Formation, Texas High Plains.

The Sun Oil Company versus Earnest Whitaker case is reviewed. The 11th court of Civil Appeals (Eastland Court) concluded on June 26, 1970, that the points presented by Sun Oil as appellant are without merit. The judgement of the Judicial District Court denying the Sun Oil Co. free use of water from a well drilled by the Sun Oil Co. on Whitaker's land was affirmed with this fourth Court decision. Sun Oil Co. first filed to prevent E. Whitaker from interfering with its drilling of a water well on his property; the court, and an appeal court, denied Sun Oil Co. the injunction. The Texas Supreme Court affirmed the decision and returned the case to a lower court to determine the intention of the oil and gas lease in terms of free use of water from the Ogallala Formation for water flooding and pressure maintenance. The entire opinion of the Eastland Court is presented because of its relevance to the Texas High Plains. (Popkin-Arizona)
W71-12119

THE NITRATE DILEMMA.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 02K.
W71-12122

AQUIFER MODELING RESEARCH MEETING,
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 02F.
W71-12123

PUMP IRRIGATION ON THE COLORADO HIGH PLAINS,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 04B.
W71-12125

APOLLO 9 EYES WATER MANAGEMENT.
High Plains Underground Water Conservation District No 1, Lubbock, Tex.
For primary bibliographic entry see Field 07B.
W71-12126

POPULATION TO WATER ABOUNDS.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.

Cross Section, Vol 16, No 8, August 1970, p 1-2. 2 ref.

Descriptors: *Population, *Water conservation, *Water resources development, *Project benefits, *Urbanization, Project purposes, Urban sociology, Water utilization, Water supply, Economics, Education, Decision making, Political aspects, Texas, Economic factors.

The 1970 census revealed the end, and possible reversal, of the continued population growth of the western part of Texas. Western population grew vigorously until reaching full utilization of a limited water supply; resources will waste to nonuse without additional water supplies. Stability of agricultural voting is threatened by the newly enacted voting priviledge to 18-year olds and urban migration of those below thirty years old. Since all large-scale water development projects undergo one or more elections requiring approval by the general public, the young urban voter has a disproportionately large effect on agriculture in the State. The urbanite must be educated to understand and appreciate metropolitan dependence upon the rural economy as the urban dweller gains a much stronger influence on decision making and on the economy. (Popkin-Arizona)
W71-12130

THE OVERHEAD SPRINKLERS OF ISRAEL: HOW TO PROVIDE A NICE, WET PLACE WHERE INSECTS YOU DON'T WANT THRIVE,
Volcani Inst. of Agricultural Research, bet-Dagan (Israel).
E. Rivnay.
Natural History Special Supplement, The Ecological Aspects of International Development Conference, Conservation Foundation, Washington, D.C., and Center for the Biology of Natural Systems, St. Louis, Missouri, p 56-61, Dec 9-11, 1968. 13 ref, 1 fig.

Descriptors: *Insects, *Pest control, *Irrigation effects, *Arid lands, *Irrigation, Insect control, Insect behavior, Insect eggs, Growth stages, Larvae, Damages, Productivity, Agriculture, Sprinkler irrigation, Ecology, Animal populations, Balance of nature.
Identifiers: *Israel, *Crop damage.

Recent extensive crop irrigation in the arid farm lands of Israel has created a favorable microclimate for insect pests. In many cases, irrigation prolongs the life of host plants which would not normally be available for much of the year. Increased practice of monoculture has brought about increased populations of serious monophagous pests such as weevils. Aphids will remain on trees continually producing new growth because of irrigation. Insects not formerly classified as pests have begun to cause considerable crop damage, and pest species will travel several hundred kilometers to reach irrigated croplands. The moist soils and high humidity levels of irrigated land are favorable for the growth and development of eggs, larvae, and pupae of pests. Although crop irrigation has improved the productivity of this desert region, increase of crop damage by insects is a serious disadvantage. (Yensen-Arizona)
W71-12131

OIL PUMPS STOP AUTOMATIC SPRINKLER.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.

Cross Section, Vol 16, No 12, December 1970, p 2-3. 5 fig.

Descriptors: *Sprinkler irrigation, *Leases, *Irrigation efficiency, *Legal aspects, *Water conservation, Irrigation practices, Groundwater, Water resources development, Oil wells, Automatic control, Texas.
Identifiers: High Plains Underground Water Conservation District (Tex).

The Court of Civil Appeals of Texas, San Antonio, ruled on a conflict of air space use above farmland on July 22, 1970, on Jones vs. Getty Oil Company (458 S.W. 2d 93). Jones sought to enjoin Getty, the mineral lessee, from maintaining oil pumps which interfere with a 'valley' irrigation sprinkler system. Getty drilled two wells and installed tall pumps after the farmer installed the sprinklers. The valley system has a clearance of 7 feet, while the Getty pumps are 17 and 34 feet on the upstroke, making the sprinklers useless. The Gaines County District Court found that it was not reasonably necessary for Getty to use pumps which interfere with Jones' self-propelled sprinklers; however, the Judge entered a 'non obstante veredicto,' as the jury favored Jones and the Judge overruled and favored Getty. Jones appealed to the San Antonio Courts of Civil Appeals which overruled the lower court in favor of Jones. The Appeals Court found that the Standard Oil and Gas lease provide for the farmers reasonably necessary use. Two other oil companies have wells equipped with small pumps or pumps in cellars to accomodate the valley system. The case now goes to the Texas Supreme Court. Efficient use of effective automatic sprinkler irrigation is an important groundwater conservation practice on the Plains. The High Plains Underground Water Conservation District is preparing an 'amicus curiae' (friend of the court) brief in Jones' support for the Texas Supreme Court. (Popkin-Arizona)
W71-12132

WATER DEPLETION TAX ALLOWANCE MAPS.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 06C.
W71-12133

THE IMPACT OF DROUGHT ON BEEF CATTLE NUMBERS IN THE CHANNEL COUNTRY OF SOUTHWEST QUEENSLAND, AUSTRALIA,
University of New England, Armidale (Australia). Dept. of Geography.
A. C. B. Allen.
Association of Pacific Geographers, Yearbook, Vol 33, p 107-126, 1971. 14 fig, 2 tab, 10 ref.

Descriptors: *Cattle, *Droughts, *Grazing, *Arid lands, *Environmental effects, Rainfall, Economic efficiency, Climatic data, Transportation, Floods, Vegetation effects.
Identifiers: *Australia.

The Channel country is a region of low, unreliable rainfall subject to infrequent floods resulting in a bloom of river-flat herbage and grasses. Occasional cyclonic depressions bring drenching rains followed by extensive vegetational growths, even in areas far removed from the flood plains and at the margins of the Simpson Desert. This variable, harsh climate demands a high level of adjustment by pastoralists, and the history of ranching in this region in the last century, is characterized by a variety of strategies, many of which were doomed by drought. This trial-and-error process finally evolved into strings of chain stations, reducing drought risk in any one area, a more accurate assessment of long-term carrying capacity related to vegetation, a high labor force instead of capital improvements, and a specialized form of cattle transport to regional markets. Until recently, store cattle (low quality cattle) were brought in from the Northern Territory, finished during the period of lush vegetation and trucked to the markets. In the last decade a number of factors combined to reduce the volume of store cattle flowing into the Channel Country, resulting in the buildup of permanent breeding herds. The breeding herds put far more pressure on the grazing habitat than the former temporary grazers. The severe drought of 1965-1967 caused large losses in these herds, and when the rains finally came, there were no longer enough cattle available to utilize the vegetation. Permanent breeding herds cannot be maintained in this marginal arid climate and it is asserted that for pastoral agriculture to survive in this area, store cattle must again be made available for efficient utilization of plant productivity in relation to the sporadic rainfall. (Casey-Arizona)
W71-12134

THE RELATION OF PARTICLE SIZE TO AVAILABLE MOISTURE IN SOILS OF ZUBAIR,
Iraq Institute for Research on Natural Resources, Baghdad.
For primary bibliographic entry see Field 02G.
W71-12135

SCHISTOSOMIASIS, THE DISEASE OF SLOWED-DOWN WATERS: CONTROL IN EGYPT AND THE SUDAN,
Michigan Univ., Ann Arbor. Museum of Zoology.
For primary bibliographic entry see Field 05C.
W71-12136

WATER CONSERVATION AND FARM LEASES.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.

Cross Section, Vol 16, No 9, September 1970, p 1-2. 1 ref.

Descriptors: *Leases, *Water conservation, *Contracts, *Irrigation efficiency, *Crop production, Farm units, Water management (Applied), Farm management, Investment, Groundwater mining, Texas, Land tenure.
Identifiers: Texas High Plains, Ogallala Aquifer.

Informal leasing of farmland by landowners (lessors) and tenants worked well in the Texas High Plains when lessors and tenants were neighbors; farm and water management were less complex, and farm profits were not squeezed. Cash leasing is a recent common practice, where the tenant invests and hopes to produce a bumper crop, with or without regard to the lessor's interest. Nearly 70 percent of the High Plains is underlain with groundwater (Ogallala Aquifer), owned by the lessor, and perhaps developed by the tenant. The tenant's management of the landowner's groundwater is of concern. George McCleskey presented a paper on farm leases (Farm and Ranch Law Institute, Texas Tech University, School of Law, September 26, 1970) which emphasizes the efficient irrigation use of groundwater in a mining area, such as the Southern High Plains. A water use contract between lessor and tenant is suggested. Groundwater conservation is inevitable if such agreements become common practice. (Popkin-Arizona)
W71-12137

WINDMILLS, PLAINS, AND PEOPLE,
Texas Tech. Univ., Lubbock.
For primary bibliographic entry see Field 06G.
W71-12138

IMPORTANT I.R.S. DETERMINATION.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.

Cross Section, Vol 16, No 11, November 1970, p 1-2.

Descriptors: *Irrigation practices, *Groundwater mining, *Water law, *Taxes, Property values, Costs, Texas, Land tenure.
Identifiers: *Depletion allowance, *High Plains (Tex), *Semiarid lands.

Recent interpretation of 1959 Internal Revenue Service Ruling Number 59-220 could be important to irrigators in the Southern High Plains, a semiarid agricultural region dependent on groundwater in west Texas. The interpretation involves the recognition of a 'holding period' by the I.R.S. Land acquired before 1948 did not involve a cost in the groundwater, therefore no income-tax allowance is permitted on groundwater depletion even if groundwater was used to create income. The new interpretation is such that inheritors of an estate will have a 'holding period' commencing on the predecessor's date of death and a new water cost will be assumed on this date. This new interpretation is beneficial to survivors who will now be able to claim a depletion allowance on all property while paying inheritance taxes on only one-half the estate. (Popkin-Arizona)
W71-12141

APOLLO 9 EYES AGRICULTURE.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 07B.
W71-12142

AQUACULTURE AND THE LAW,
Miami Univ., Coral Gables, Fla. School of Law.
For primary bibliographic entry see Field 06E.
W71-12148

OBSERVATIONS ON FLORIDA'S AQUACULTURE LAW,
For primary bibliographic entry see Field 06E.
W71-12163

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

FLOOD PLAIN INFORMATION, MAUNABO RIVER, VICINITY OF MAUNABO, PUERTO RICO.
Corps of Engineers, Jacksonville, Fla.

Army Corps of Engineers Flood Plain Report, October 1970. 27 p, 3 fig, 10 plate, 6 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Puerto Rico, Regional flood, Flood forecasting, Flood control, Historic flood, Peak discharge, Urbanization.
Identifiers: *Floods (Maunabo, Puerto Rico), Standard project flood, Intermediate regional flood.

The flood situation along the Maunabo River in the vicinity of Maunabo, Puerto Rico is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The area of the Maunabo River studied extends from the mouth of the river to its confluence with Quebrada Tumbada, 5.78 kilometers upstream. It is within this reach that the rather narrow mountain stream opens up into a broad alluvial flood plain which has been completely flooded by past floods. Practically all the land flooded in the past was planted in sugarcane. The only settlement affected was Columbia, the site of the old sugar refinery. The town of Maunabo has thus far escaped flooding because of its location just beyond the flood-plain limits. However, recent development and growth in Maunabo have extended the urban limits of the town into the flood plain. (Woodard-USGS)
W71-11786

FLOOD PLAIN INFORMATION, LIMESTONE CREEK, MANLIUS TOWNSHIP, ONODAGA COUNTY, NEW YORK.
Corps of Engineers, Buffalo, N.Y.

Army Corps of Engineers Flood Plain Report, December 1970. 54 p, 36 fig, 11 plate, 9 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *New York, Regional flood, Flood forecasting, Flood control, Historic flood, Peak discharge.
Identifiers: *Floods (Onondaga County, N.Y.), Standard project flood, Intermediate regional flood.

Flooding along Limestone Creek in Manlius, Fayetteville, and Minoa, New York is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The flooded area along Limestone Creek extends from its mouth to a point about thirteen miles upstream which is south of Manlius. Flood damage is greatest within the villages of Fayetteville and Manlius. In the past the largest flood damage was to agriculture, however, the large increase in development during the last 20 years and the reduction in the number of farms throughout the basin has reduced the agricultural damages and increased the urban damages. (Josefson-USGS)
W71-11791

EMBANKMENT DRAINAGE AFTER INSTANTANEOUS DRAWDOWN,
Waterloo Univ. (Ontario).
H. B. Poorooshasb, and J. Forati.
Proceedings, 7th International Conference on Soil Mechanics and Foundations Engineering, p 349-353, Mexico, 1969. 5 p, 5 fig, 2 ref.

Descriptors: Permeability coefficients, Permeability, Integrals, Fluid flow, *Saturation zones, Saturation, *Phreatic lines, Analysis, Drawdown curves, *Earth dams, *Drawdown, Coefficients, Embankments, Calculations, Equations, Pervious soils, Velocity, Mathematics, *Rapid drawdown, Soil mechanics, Transient flow, flow nets, Foreign research.
Identifiers: Saturation curves, Potential gradients, Canada.

A permeable membrane is defined as a hypothetical membrane of sufficiently small thickness having a coefficient of permeability of infinity. The basic property of a permeable membrane is that when inserted in a solid mass the set of points in its neighborhood acquire equal potentials. Thus, with the use of such a membrane, obtaining simple potentially admissible solutions to rather com-

plicated problems may be possible. The concept of the permeable membrane is used to study the variation in the position of the so-called saturation line in the upstream face of an earth dam with a vertical impermeable core when subjected to instantaneous drawdown. Accuracy of results of the analytical study is judged against the experimental evidence of Newlin and Rossier (1967). Although the basic aim of the report is to demonstrate the usefulness of such a simple concept, rather than its application to any particular situation, the problem cited is, in itself, of considerable practical importance. (USBR)
W71-11817

CHANNEL RECTIFICATION ENGINEERING SURVEY PROGRAM,
Corps of Engineers, Little Rock, Ark. Surveys Section.
For primary bibliographic entry see Field 07C.
W71-11987

FLOOD PLAIN INFORMATION, NEW RIVER, BAYOU FRANCOIS AND BLACK BAYOU, GONZALES AREA, LOUISIANA.
Pyburn and Odom, Baton Rouge, La.

Army Corps of Engineers Flood Plain Report, March 1971. 35 p, 7 fig, 26 plate, 13 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Louisiana, Regional flood, Flood forecasting, Flood control, Historic flood, Peak discharge.
Identifiers: *Floods (Gonzales, La), Standard Project Flood, Intermediate Regional Flood.

The flood situation along New River, Bayou Francois, and Black Bayou in the vicinity of Gonzales, Louisiana is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The flood season for the Gonzales area extends throughout the year. The drainage basin area contributing to flows within the study area is small enough to permit flooding as the result of intense local rainfall, such as that occurring during thunderstorms. During the Standard Project Flood it is expected that flood waters would remain out of the channel for about 25 hours. The total rise in the stream water surface elevation from normal low water to the Standard Project Flood peak is approximately 7.5 feet. The rise would occur at a maximum rate of about 0.8 foot per hour. (Woodard-USGS)
W71-11997

OPTIMAL PLANS FOR THE CAPACITY EXPANSION OF A MUNICIPAL WATER TREATMENT-DISTRIBUTION SYSTEM,
Illinois Univ., Urbana, Dept. of Business Administration.
For primary bibliographic entry see Field 05D.
W71-12040

ARIZONA PLANT CLIMATE ZONES,
Arizona Univ. Tucson. Cooperative Extension Service.
For primary bibliographic entry see Field 02I.
W71-12098

SOME RECENT DEVELOPMENTS IN THE SEARCH FOR SOLUTIONS TO CALIFORNIA'S WATER SUPPLY PROBLEMS,
Birbeck Coll., London (England). Dept. of Geography.
J. F. Davis.
Tijdschrift voor Economisch en Social Geografie, Vol 62, No 2, p 95-103, March-April 1971. 2 fig, 2 ref.

Descriptors: *Planning, *California, *Diversion dams, *Water distribution (Applied), *Water quality, Drainage programs, Irrigation practices, Wildlife conservation, Arid lands, Water supply, Legal aspects, Municipal water, Crops, Recreation, Prior appropriation, Riparian rights, Economic feasibility.
Identifiers: *California Water Plan, *Central Valley Project.

The water supply problem in California has always been rooted in the imbalance of water between the wet, mountainous north and the arid-semiarid south with most of the population and agriculture. In the last century, massive diversion projects designed to bring water to the Los Angeles-San Diego population center and to irrigated agriculture in the Central Valley have been constantly expanded and supplemented by new schemes. This resulted, in 1957, in the formulation of an integrated state plan for water diversion and development called the California Water Plan. The Plan involves a linkage of dams and aqueducts from the north to Los Angeles, and will provide water for urban needs, agricultural developments and recreation. The major canals, dams, and areas of distribution are described, along with problems that will be created by the project. California's water problems are not only a matter of supply but also a matter of drainage; problems of soil salinity, alkalinity, flooding and waterlogging will be exacerbated alongside the steady growth of water pollution and sewage. A further possible problem is groundwater degradation. A number of possible solutions are considered and it is felt that one of the better possibilities is the creation of large evaporation areas which could be further developed as wildlife habitats. The development of new high production agricultural lands may worsen surpluses of certain crop tests and put established operators at a disadvantage because of higher capital improvement costs. Although some of the Project water has been allocated for effluent removal, the problem will increase due to increased urbanization and suburbanization facilitated by the Project itself. (Casey-Arizona)
W71-12128

THE OVERHEAD SPRINKLERS OF ISRAEL: HOW TO PROVIDE A NICE, WET PLACE WHERE INSECTS YOU DON'T WANT THRIVE,
Volcani Inst. of Agricultural Research, bet-Dagan (Israel).
For primary bibliographic entry see Field 03F.
W71-12131

4B. Groundwater Management

RADIOLOGICAL STATUS OF THE GROUNDWATER BENEATH THE HANFORD PROJECT, JAN.--JUNE 1970,
Battelle-Northwest Lab., Richland, Wash.
For primary bibliographic entry see Field 05B.
W71-11665

ANALOG MODEL STUDY OF THE GROUNDWATER BASIN OF THE UPPER COACHELLA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
Stephen J. Tyley.
Geological Survey Open-file Report, January 28, 1971. 89 p, 38 fig, 18 tab, 51 ref.

Descriptors: *Water resources development, *Groundwater, *Hydrogeology, *Water supply, *California, Analog models, Aquifers, Aquifer characteristics, Withdrawal, Groundwater recharge, Forecasting, Water demand, Hydrologic budget.
Identifiers: *Groundwater resources.

The hydrology of the upper Coachella Valley in California--from San Gorgonio Pass southeast to Indio is presented. An electrical analog model was constructed to determine the effect of imported water on the groundwater levels. The upper Coachella Valley has sustained a depletion of groundwater in storage of about 600,000 acre-feet during the period 1936-67. This has resulted in water-level declines--as much as 75 feet in the Palm Springs area. Projected pumpage was programed onto the model along with the proposed quantities of recharge of Colorado River water for the period 1968-2000. The model indicated that water levels would show a net rise of 20 feet at Windy Point--the proposed recharge site--by 1980, a 130-foot rise by 1990, and a 200-foot rise by the year 2000. The proposed quantities of recharge will have beneficial effects on the groundwater system as far south as Palm Desert by 1980, Point Happy by 1990, and possibly the Coachella Canal by 2000. (Woodard-USGS)
W71-11752

U.S. GEOLOGICAL SURVEY TRACER STUDY, AMARGOSA DESERT, NYE COUNTY, NEVADA--PART 2: AN ANALYSIS OF THE FLOW FIELD OF A DISCHARGING-RECHARGING PAIR OF WELLS,
Geological Survey, Denver, Colo.
David B. Grove.
Available from National Technical Information Service, Springfield, Va. 22151 - Price - printed copy $3.00; microfiche $0.95. Geological Survey Report USGS-474-99, 1971. 56 p, 17 fig, 1 tab, 8 ref, append. USAEC Agreement No AT (29-2)-474.

Descriptors: *Groundwater movement, *Water wells, *Withdrawal, *Groundwater recharge, *Model studies, Aquifer characteristics, Porosity, Flow rates, Flow profiles, Computer programs, Mathematical studies.
Identifiers: *Groundwater flow field.

Two transport models, plug flow and dispersed flow, were used to evaluate the flow field between a discharging-recharging pair of wells. A numerical solution for the plug-flow model resulted in plots of dimensionless groups that allow prediction of travel times between wells along streamlines. A numerical solution for the dispersed-flow model allows evaluation of the porosity and dispersion constant of the aquifer. The technique is applicable for pulse tracer injection and recirculation. The computer program is presented. (Woodard-USGS)
W71-11755

HYDROGEOLOGIC DATA FROM GOVE, LOGAN, AND WALLACE COUNTIES, KANSAS,
Kansas Geological Survey, Lawrence; and Geological Survey, Colby, Kans.
For primary bibliographic entry see Field 07C.
W71-11783

GROUND-WATER PUMPAGE AND RELATED EFFECTS, SOUTHWESTERN LOUISIANA, 1970, WITH A SECTION ON SURFACE-WATER WITHDRAWALS,
Geological Survey, Baton Rouge, La.
Allen L. Zack.
Louisiana Geological Survey and Department of Public Works Water Resources Pamphlet No 27, April 1971. 33 p, 7 fig, 2 plate, 3 tab, 2 ref.

Descriptors: *Groundwater, *Surface waters, *Withdrawal, *Irrigation, *Louisiana, Rice, Pumping, Livestock, Water table, Water levels, Hydrologic data, Water level fluctuations, Water quality, Water analysis, Water yield, Groundwater recharge, Saline water intrusion, Rainfall, Industrial water.

Groundwater withdrawals for rice irrigation in southwestern Louisiana are inversely related to the total rainfall during the rice-growing season. This relationship can be used to estimate groundwater pumpage if precipitation figures are known. Continually increasing groundwater pumpage from the Chicot aquifer has caused water levels in wells to decline steadily; rapidly declining water levels necessitate frequent lowering of pump intakes in

the Lake Charles area and also locally in Evangeline Parish. Groundwater withdrawals of 345 billion gallons in 1969 caused a 2-foot decline of the annual weighted-average water level in 1970, and withdrawals of 423 billion gallons in 1968 caused a 4-foot drop in water levels in 1969. In 1968, 770 billion gallons of water was pumped from streams in southwestern Louisiana. In some places this pumpage has seriously affected the chemical and thermal quality of the water in streams and bayous. (Woodard-USGS)
W71-11790

INVESTIGATION OF THE FEASIBILITY OF THE DEVELOPMENT OF A WATER RESOURCES MANAGEMENT MODEL FOR THE HIGH PLAINS AREA OF OKLAHOMA,
Oklahoma State Univ., Stillwater. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W71-11860

WATER-RESOURCES INVENTORY, SPRING 1969 TO SPRING 1970, ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02G.
W71-11992

EASTLAND COURT HEARS WHITAKER CASE.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 06E.
W71-12102

STUDIES OF GROUNDWATER HYDROLOGY--I. HYDRAULIC PARAMETERS OF THE TERTIARY TAPPED IN THE COUNTRYSIDE OF CARTAGENA, MURCIA, SPAIN (Estudios de Hidraulica subterranea--I. Parametros hidraulicos del Acuifero Burdigaliense Captado en el Campo de Cartagena (Murcia)),
Instituto de Orientacion y Asistencia Tecnica del Sureste, Murcia (Spain).
For primary bibliographic entry see Field 02F.
W71-12103

IN A DISASTER: THE ROLE OF GROUNDWATER.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.

Cross Section, V 16, N 5, May 1970, p 1-2. 4 fig.

Descriptors: *Disasters, *Groundwater, *Water storage, *Water demand, *Power operation and maintenance, Safety, Costs, Tornadoes, Texas, Storms, Water wells, Failure (Mechanics), Manual control, Automatic control, Dual system, Surface waters.
Identifiers: Canadian River Municipal Water Authority.

Groundwater's safety, convenience, purity and low cost are often not appreciated, except in an emergency, such as the disastrous tornado that struck Lubbock (Texas) on the night of May 11, 1970. About 5 million gallons of water were in storage to meet the 35 million gallon daily demand. The storm knocked out both of the city's in-town generating stations serving the surface water supply from the Canadian River water treatment plant. The Canadian River Municipal Water Authority and the City of Lubbock turned to wells which supplied 20 million gallons a day from the nearby sandhill well field. This water arrived in Lubbock within 8 hours, which was enough time to start manual operation of the river-water pipeline. This emergency emphasized the importance of a dual (ground and surface) water supply system. (Popkin-Arizona)
W71-12104

RECOVERING AGRICULTURAL WATER, A LOCAL APPROACH.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 03F.
W71-12110

STUDIES OF GROUNDWATER HYDROLOGY--II. HYDRAULIC PARAMETERS OF THE UPPER TERTIARY-LOWER QUATANARY, LOCATED IN THE COUNTRYSIDE OF MIJAR, ALMERIA, SPAIN. (Estudios de Hidraulica Subterranea--II. Parametros Hidraulicos Institute of Del Acuifero Contenido en el Terciario Superior-Cuaternario, en el Campo de Mijar, (Almeria)),
Instituto de Orientacion y Asistencia Tecnica del Sureste, Murcia (Spain).
For primary bibliographic entry see Field 02F.
W71-12117

DISTRICT PRESENTS STATEMENT BEFORE THE TEXAS WATER RESOURCES STUDY COMMITTEE.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 06E.
W71-12118

EASTLAND COURT RULES FOR WHITAKER.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 03F.
W71-12119

NEW DATA ON THE GEOLOGY AND HYDROLOGY OF THE REUS BASIN (Nuevos Datos Sobre La Geologia E Hidrologia De La Depresion De Reus),
Paris Univ., Thonon-les-Bains (France). Center for Geodynamic Research.
For primary bibliographic entry see Field 02F.
W71-12121

THE NITRATE DILEMMA.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 02K.
W71-12122

AQUIFER MODELING RESEARCH MEETING,
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 02F.
W71-12123

PUMP IRRIGATION ON THE COLORADO HIGH PLAINS,
Colorado State Univ., Fort Collins. Dept. of Economics.
D. D. Rohdy, R. L. Anderson, T. B. Grandin, and D. H. Peterson.
Colorado State University Experiment Station, Bulletin 543S, May 1970. 41 p, 30 tab, 3 fig.

Descriptors: *Irrigation practices, *Dry farming, *Economic impact, *Water resources development, *Water management (Applied), Water conservation, Linear programming, Projects, Optimization, Organizations, Income, Economic life, Groundwater basins, Aquifers, Irrigation water, Model studies, Crop production, Return (Monetary), Sugar beets, Irrigation wells, Colorado, Agriculture.
Identifiers: *Colorado High Plains, *Northern High Plains Groundwater Basin, *Ogallala Aquifer, Crop patterns.

The northern part of the Colorado High Plains is changing from dryland to irrigated agriculture. Economic impact of irrigation development and long-term effects are important issues examined under specific irrigation problems. Linear programming was used to determine economic life of water resource and optimum organization and income. The study area was the Northern High Plains Ground Water Basin, which depends on the Ogallala Aquifer for irrigation water. Farm and irrigation models were developed assuming high-quality management under various crop yields and crop patterns. Three farm models or areas were considered where the net return to management is positive for 85 years for Area I, 185 years for Area II, and 150 years for Area III, assuming restricted development. Greatest return is by the maximum allowable acres in high yields on sugar beets. Assumptions of the analysis are discussed in detail. Future rate of irrigation well development determines economic life of groundwater and agriculture. Forty tables show data from the models. (Popkin-Arizona)
W71-12125

NWWA DISASTER COMMITTEE.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.

Cross Section, Vol 16, No 10, October 1970, p 1. 1 ref.

Descriptors: *Water requirements, *Disasters, *Water management (Applied), *Priorities, *Water resources development, Inspection, Financing, Coordination, Droughts, Flooding, Storms, Tornadoes.
Identifiers: Texas High Plains, Semi-arid lands.

The National Water Well Association organized and funded a Disaster Committee to meet the Water requirements of areas under catastrophic conditions. Committee functions include mobilization after a declared emergency, on-site inspection by groundwater experts, provision for a clearing house for management plans and such funding, coordination and mobilization of the services of engineers, geologists, drillers and suppliers, and contact with emergency-oriented agencies. The committee has brought public attention to assets and priorities for developing groundwater supplies. The Texas High Plains is a semi-arid area subject to drought, local flooding, snowstorms and tornadoes. (Popkin-Arizona)
W71-12127

POPULATION TO WATER ABOUNDS.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 03F.
W71-12130

4C. Effects on Water of Man's Non-Water Activities

MOVEMENT OF BACTERIA FROM A RIVER TO A MUNICIPAL WELL--A CASE HISTORY,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 05B.
W71-11716

EFFECTS OF URBAN DEVELOPMENT ON THE HYDROLOGY OF LONG ISLAND, NEW YORK,
Geological Survey, Arlington, Va.
For primary bibliographic entry see Field 07B.
W71-12002

EASTLAND COURT RULES FOR WHITAKER.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 03F.
W71-12119

POPULATION TO WATER ABOUNDS.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.

For primary bibliographic entry see Field 03F.
W71-12 130

4D. Watershed Protection

PREVENTING AND CONTROLLING POLLUTION OF THE POTOMAC RIVER.
District of Columbia City Council, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-12156

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

PHYSICAL, CHEMICAL AND BIOLOGICAL MEASUREMENTS ON THE WATER OF THE FOSSETTO DELLA CASACCIA, (DETERMINAZIONI FISCHE CHIMICHE E BIOLOGICHE SUL FOSSETO DELLA CAS'-CACCIA),
Comitato Nazionale per l'Energia Nucleare, Rome (Italy). Laboratorio Radioattivita Ambientale.
L. Cigna Rossi, and S. Matta.
RT/PROT (70) 33, Nov 1970. 29 p, 3 fig, 5 tab, 12 ref.

Descriptors: *Radioisotopes, *Aquatic plants, *Nuclear wastes, Absorption, Aquatic animals, Streams, Foreign research, Strontium radioisotopes, Cobalt radioisotopes, Zinc radioisotopes, Crustaceans, Gastropods, Tubificids, Water analysis, Hydrogen ion concentration, Temperature, Oxygen, Carbon dioxide, Water pollution effects.
Identifiers: Iron radioisotopes.

The tract of stream along the boundary of the Casaccia Nuclear Center was studied; particularly fauna, and sediment mineralogy. Water properties (pH, temperature, oxygen, and carbon dioxide), chemical analysis of the water and of some aquatic plants, and concentration factors for radionuclide uptake were determined. (Bopp-NSIC)
W71-11672

ENVIRONMENTAL SURVEILLANCE FOR RADIOACTIVITY IN THE VICINITY OF THE CRYSTAL RIVER NUCLEAR POWER PLANT: AN ECOLOGICAL APPROACH.
Florida Univ., Gainsville. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05C.
W71-11674

SOME PROBLEMS OF THE CLASSIFICATION OF PECTINIDS,
V. N. Sinel'nikova.
Available from the National Technical Information Service as TT-70-50128, $3.00 in paper copy, $0.95 in microfiche. TT-70-50128, Translated for the Smithsonian Institution and the National Science Foundation by the Israel Program for Scientific Translations - 1970, From: Biostratigrafiya, Fauna i Flora Kainozoya Severo-Zapadnoi Chasti Tikhookeanskogo Podvizhnogo Poyasa, Moskya, 1969, p 84-94. 5 fig, 17 ref.

Descriptors: *Systematics, Classification, Mollusks.
Identifiers: *Pectinids.

Studies of pectinids of the Kamchatka and Fortipecten takahashi (Yokohama) group of the Marugama suite of Sakhalin confirm, the value of examining the hinge morphology of pectinids in determining subfamilies, genera, and, in some cases, species. Various characteristics of the hinge areas are illustrated and discussed to show that species previously placed in one genus can be divided into several genera. (Little-Battelle)
W71-11676

THE PROPERTIES OF PERSISTENT OILS AT SEA,
Esso Petroleum Co. Ltd., London (England); and British Petroleum Co. Ltd., Sunbury-on-Thames (England). Research Centre; and Shell Research Ltd., London (England); and Shell International Petroleum Co. Ltd., London (England).
S. A. Berridge, R. A. Dean, R. G. Fallows, and A. Fish.
Journal of the Institute of Petroleum, Vol 54, No 539, p 300-307, November 1968. 3 fig, 4 tab, 15 ref.

Descriptors: *Dispersion, *Evaporation, Oil, Oily water, Oxidation, Emulsions, Biodegradation, Sulfur, Specific gravity, Viscosity, Asphalt, Acidity, Weathering, Aging (Physical).
Identifiers: *Crude oils, *Cleanup, *Oil characterization, Residues, Wax, Pour point, Vanadium.

The properties of seven crude oils which are shipped to Europe in bulk and therefore likely to give rise to pollution were examined with regard to their significance in the context of oil removal or dispersal. The properties investigated are specific gravity, sulfur content, kinematic viscosity, pour point, wax content, asphaltenes, vanadium content, acidity, and residue content, pour point, and specific gravity. Among the physical, chemical, and biological processes which operate on spilled crude oil are evaporation, spreading, emulsification, dissolution, oxidation, bacterial removal, sinking, adsorption by particulate matter, and mechanical transport by wind, tide, or currents. These processes are considered with regard to their affect on cleanup and elimination of pollution. Spreading and emulsification are competitive processes with the former possibly being desirable for dispersal of spills and the latter causing agglomeration and subsequent contamination of shore areas. Biological degradation is too slow to be of any significance in spill cleanup. Evaporation is probably the most important process affecting dispersal; however, oxidation and dissolution of oil also play important parts. (Little-Battelle)
W71-11677

ANALYSIS OF BEACH POLLUTANTS,
British Petroleum Co. Ltd., Sunbury-on-Thames (England). Research Centre.
J. V. Brunnock, D. F. Duckworth, and G. G. Stephens.
Journal of the Institute of Petroleum, Vol 54, No 539, p 310-325, November 1968. 8 fig, 11 tab, 8 ref.

Descriptors: *Oils, *Weathering, Sulfur, Aging (Physical), Specific gravity, Viscosity.
Identifiers: *Crude oil, *Fuel oil, *Oil characterization, Sludge, Vanadium, Nickel, Paraffin, Spills, Wax, Boiling point, Residues.

A number of characteristics of crude oils, crude oil sludges, and fuel oils are discussed relative to methods of characterizing oil spills. Oil may be distinguished by wax content, boiling points, sulfur content, asphaltene content, and other qualities. However, studies of samples from the Torrey Canyon wreck have shown that weathering modifies many of these values. The studies also showed that nickel, vanadium, and n-paraffin contents are not affected by weathering. A scheme is presented, based upon these parameters together with values of sulfur content, for identifying some weathered crudes. (Little-Battelle)
W71-11678

THIN-LAYER CHROMATOGRAPHY OF CARBON ADSORPTION EXTRACTS PRIOR TO GAS CHROMATOGRAPHIC ANALYSIS FOR PESTICIDES,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio. Water Pollution Surveillance System.
Doris Smith, and James Eichelberger.
Journal Water Pollution Control Federation, Vol 37, No2, p 77-85, January 1965. 4 fig, 4 tab, 5 ref.

Descriptors: *Gas chromatography, *Separation techniques, *Analytical techniques, Aldrin, Dieldrin, Heptachlor, DDT.
Identifiers: *Thin layer chromatography, Lindane, Carbon chloroform extract (CCE), Steam distillation, Column chromatography, Carbon adsorption, Cleanup.

In order to measure trace quantities of organic pesticides in complex mixtures, cleanup and separation methods are needed. Preliminary investigations, using these methods, were made of three procedures: steam distillation, column chromatography, and thin-layer chromatography. Only thin-laye r chromatography showed enough promise as a cleanup and separation procedure to merit further study. A more thorough investigation of the TLC method offers the following advantages over previous methods: (1) the quantitative determination of chlorinated pesticides in a complex mixture is more accurate, (2) a larger variety of pesticides can be identified and quantified, and (3) it provides corroborative evidence of the presence or absence of a particular pesticide. Two figures illustrate gas chromatograms of the separated pesticides. (McCann-Battelle)
W71-11679

QUANTITATIVE CONTENT OF PHENOL-DESTRUCTIVE BACTERIA IN THE DESNA RIVER WATER IN CONNECTION WITH ITS CONTAMINATION BY PHENOLS,
Joint Publications Research Service, Washington, D.C.
D. Z. Gak.
Available from the National Technical Information Service as JPRS-44961, $3.00 in paper copy, $0.95 in microfiche. JPRS-44961, April 5, 1968. 5 p, 3 tab, 3 ref.

Descriptors: *Phenols, *Bioindicators, Bacteria, Industrial wastes.
Identifiers: *Phenol bacteria, Desna River (U.S.S.R.), U.S.S.R.

Water samples were collected from three locations of the Desna River and analyzed for phenol-destructive bacteria to determine whether these bacteria can be used as an index of phenol contamination in water. The results showed that small quantities of the bacteria (up to 100 cells/ml) were present throughout the examined sections of the Desna River and its tributaries. However, sections that were contaminated with phenol showed sharp increases in phenol-destructive bacteria numbering in the thousands of cells/ml. It is concluded on the basis of the outcomes of chemical and bacteriological tests that these bacteria may be useful as indicators of phenol contamination. (Little-Battelle)
W71-11680

SPECIFIC ION ELECTRODES,
For primary bibliographic entry see Field 02K.
W71-11684

HOW AERIAL PHOTOGRAPHS CAN IDENTIFY AND MEASURE POLLUTANTS,
Cornell Aeronautical Lab., Buffalo, N.Y.
Kenneth R. Piech.
Public Works, Vol. 101, No. 3, p 68-71, March 1970. 4 fig.

Descriptors: *Pollutant identification, *Aerial photography, *Mathematical methods, Municipal wastes, Industrial wastes, New York, Algae, Water pollution.
Identifiers: Niagara River.

Aerial photography can be used to both measure and quantify pollutants in waterways. It has the potential of providing pollution data for an entire waterway rather than isolated points and is often able to pinpoint the source of a particular pollu-

tant. The method is based on the fact that every substance has a characteristic spectral curve by which it can be identified. By using specially constructed spectral filters, photographs can be taken in which light outside a given range of wavelengths (the spectral curve of the pollutant to be identified falls within the range) is filtered out. On the developed photograph, the pollutant then shows up lighter and its quantity can be determined by mathematical analysis, in parts per million, for example. In reality, it would be impractical to construct filters for each pollutant, since many substances have very similar spectral curves. Thus, the practicality of singling out a specific pollutant is largely governed by its type compared with the combinations of other pollutants that may also be present. Because the type of pollutant is often known, the ability to track it by photography is probably of more importance. The method can also be used to measure algal concentrations. (Mortland-Battelle)
W71-11685

REMOTE MEASUREMENT OF OCEAN COLOR AS AN INDEX OF BIOLOGICAL PRODUCTIVITY - A PRELIMINARY SUMMARY REPORT,
Woods Hole Oceanographic Institution, Mass.
George L. Clarke, Gifford C. Ewing, and Carl J. Lorenzen.
Proceedings of the Sixth International Symposium on Remote Sensing of Environment, Vol. II, p 991-1001, October 13, 14, 15, 16, 1969. 7 fig, 1 tab, 3 ref.

Descriptors: *Aquatic productivity, *Spectrometers, *Remote sensing, Infrared radiation, Water temperature, Chlorophyll, Color, Oceans.

Spectra of an ocean site 40 degrees N 68 degrees W were collected with an electro optical airborne spectrometer in an attempt to determine whether small differences between low concentrations of chlorophyll are associated with detectable shifts in the color of light backscattered from beneath the ocean and whether such changes are measurable at higher altitudes. The target area encompassed two distinct water types, one typical of the sterile Gulf Stream, the other more typical of the fertile water over fishing banks. Overflights were made at 500, 1,000, 2,000, 5,000, and 10,000 feet. Simultaneous surface temperatures were taken to position the spectra over the two water masses. Temperature and chlorophyll samples were also taken from a ship located in the area. The two sets of data were to be compared. The data collected from the overflights showed that in all but one case, high color ratio coincided with cold water and low color ratio with warm water. As flight altitude increased, differences in color ratios were somewhat diminished. Although extensive comparison of color ratios with chlorophyll and associated carteneids contents was not possible, it is probable that these substances were the primary cause of color differences. Remote sensing appears to hold promise for monitoring the biological productivity of the oceans. (Little-Battelle).
W71-11686

A COMBINATION OF RING-OVEN AND CIRCULAR CHROMATOGRAPHY OF TRACE METAL ANALYSIS,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Chemistry.
R. W. Frei, and C. A. Stockton.
Mikrochimica Acta, p 1196-1203, 1969. 1 fig, 2 tab, 20 ref.

Descriptors: *Chromatography, *Cobalt, *Copper, *Iron, Trace elements, Algae, Sea water, Fresh water.
Identifiers: *Nickel, Detection limits, Chemical interferences.

A chromatographic method for metal chelates of pyridine-2-aldehyde-2quinolylhydrazone (PAQH) has been adapted to the ring-oven technique. Advantage has been taken of the large difference in Rf values of the cobalt, copper, nickel and iron (III) chelates on alumina, the acid stability of the cobalt PAQH complex, selective formation of chloride complexes of these metals and the use of specific spray reagents for copper and iron, such as rubeanic acid and KSCN to develop a simple and rapid field method for trace metal analysis. Quantitative estimation of these four metals with an accuracy ranging from 5.0 to 12 percent has been carried out in less than 30 minutes. Detection limits were found to be about 0.01 microgram for nickel, 0.008 microgram for copper and iron and 0.005 microgram for cobalt. Other ions did not interfere in up to 10-fold excess. The suitability of this method for field work was tested by monitoring trace metals in fresh and sea water supplies and in algae. (Little-Battelle)
W71-11687

AUTOMATED NUTRIENT ANALYSES IN OCEANOGRAPHY,
Coast Guard, Washington, D.C. Office of Research and Development.
Neil R. Anderson.
Oceanology International, Vol. 5, No. 9, p 26-28, September 1970. 2 fig.

Descriptors: *Nutrients, *Automation, *Data collections, *Colorimetry, Seawater, Chlorine, Oxygen, Nitrogen, Phosphorus, Silicon, Nitrite, Nitrate, Pumps.
Identifiers: *Peristaltric pump, *Recorders.

A shipboard, automated, nutrient-analyzer system is described. This system circumvents the problems of manual analyses at sea or of sample preservation for analysis on return. Samples can be analyzed at a rate of at least 20 per hour, compared to 50 to 55 per day in a shore-based laboratory. Results have been shown to match those of shore-based analyses. The system operates by drawing solutions from reagent and sample reservoirs through a peristaltic pump. Precisely measured amounts of reagents and samples are introduced into manifolds constructed for particular chemical analysis. There the solutions are combined and mixed and the reactions of a particular analysis occur. The reaction mixture is then fed through a colorimeter having a continuous flow cell, and the resulting voltage output appears in analog format on a stripchart recorder. The system can be extended by converting the data to more desirable form and either displaying them, punching them into paper tape, or both. (Mortland-Battelle)
W71-11691

THE USE OF ARTIFICIAL SUBSTRATES IN POLLUTION SURVEYS,
Federal Water Quality Administration, Duluth, Minn. Water Quality Lab.
John W. Arthur, and William B. Horning, II.
American Midland Naturalist, Vol. 82, No. 1, p 83-89, July 1969. 2 fig, 3 tab, 6 ref.

Descriptors: *Benthic fauna, *Bioindicators, *Mississippi River, Chlorophyll, Sewage bacteria, Minnesota, Stoneflies, Mayflies, Midges, Amphipoda, Isopods, Oligochaetes, Nematodes, Water pollution sources, Periphyton, Water quality, Snails, Clams.
Identifiers: *Artificial substrates, *Minnesota River, Chlorophyll-a, Trichopters, Rhagionidae, Simuliidae, Psephenidae, Corixidae, Turbellaria, Limpets.

Artificial substrates were suspended in the Minnesota and Mississippi Rivers in the vicinity of Minneapolis-St. Paul to compare the organisms collected with those collected by routine bottom sampling techniques. The artificial substrates were constructed of six masonite boards 2.75 inches square and separated by masonite spacers 1.25 inches square. Five of the artificial substrates were spaced evenly across the river two feet below the water surface at each sampling location. The samplers were placed at 12 stations on the Mississippi and at six locations on the Minnesota River during July and August 1965. The samplers were recovered during October and November of 1965 and the contents analyzed. The topmost plate on each sampler was used for chlorophyll-a analysis. The remaining plates were scraped and the contents sieved through a standard No. 30 sieve, preserved, sorted, and counted. Microscopic examination was used to identify sewage fungi. The benthos recovered from the Mississippi River substrates reaffirmed the zones of water quality defined by results from conventional bottom sampling techniques, and analysis of chlorophyll-a indicated a progressive increase in periphyton crop below the major contributors of organic pollution. The numbers and kinds of benthic animals gathered from the Minnesota River substrates differed from results obtained from conventional bottom sampling methods, and suggest that the factor limiting river biota is a lack of suitable natural habitats rather than chemical quality. (Little-Battelle)
W71-11696

ULTRA-VIOLET SPECTRA OF METAL CYANIDES,
Poona Univ., (India). Dept. of Inorganic and Physical Chemistry.
D. K. Kalani, and M. A. Matin.
Laboratory Practice, Vol. 18, No. 3, p 275-278, 1969. 4 fig, 1 tab, 12 ref.

Descriptors: *Trace metals, *Spectrophotometry, *Ultraviolet radiation, Copper, Gold, Manganese, Chromium, Iron, Cobalt, Nickel, Infrared radiation.
Identifiers: *Cyanides, *Cadmium, *Mercury, Silver, Zinc, Platinum, Palladium, Copper cyanides, Gold cyanides, Manganese cyanides, Chromium cyanides, Cobalt cyanides, Nickel cyanides, Silver cyanides, Zinc cyanides, Cadmium cyanides, Mercury cyanides, Platinum cyanides, Palladium cyanides.

AR grade salts were used to prepare solid and aqueous samples of copper cyanides, silver cyanides, gold cyanides, zinc cyanides, cadmium cyanides, mercury cyanides, manganese cyanides, chromium cyanides, iron cyanides, cobalt cyanides, nickel cyanides, platinum cyanides, and palladium cyanides for use in studying their ultraviolet spectra. A Beckman DK-2 ratio recording spectrophotometer was used to make the measurements, and the results obtained were compared with others in the literature. In addition, the uv spectra were compared with the infrared spectra. The experimental data show good agreement with published results. Analysis of energy levels based on probable stereochemistry showed that there is no simple relation of the intense charge transfer bands with metal ligand frequency and the stability constants. (Little-Battelle)
W71-11697

DRY ICE HOMOGENIZATION PROCEDURE FOR FISH SAMPLES IN PESTICIDE RESIDUE ANALYSIS,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
P. E. Benville, Jr. and R. C. Tindle.
Journal of Agricultural and Food Chemistry, Vol. 18, No. 5, p 948-949, September-October 1970. 6 ref.

Descriptors: *Fishes, Pesticide residues, Bioassay, DDT.
Identifiers: *Homogenization, *Sample preservation, DDE, DDD.

Fish samples to be used in pesticide residue analyses can be more easily homogenized by the following procedure. Section the frozen fish into pieces 1/2 x 1/2 x 1 inch. Break the dry ice into 1/2 inch chunks and add an amount equal to or exceeding the weight of the fish sample to a blender. Pulverize the dry ice and the sample in the blender until a fine powder is formed. Pour the pulverized mixture in a plastic bag, close with a rubber band, and place in a freezer and allow 7 hours for the dry

ice to sublimate. This method has proved simpler and just as effective as methods employing desiccants. (Little-Battelle)
W71-11699

A METHOD OF SEPARATING INVERTEBRATES FROM SAMPLES OF AQUATIC VEGETATION,
Ministry of Agriculture, Fisheries and Food, London (England). Salmon and Freshwater Fisheries Lab.
D. G. Cross, and C. K. Minns.
Laboratory Practice, Vol. 18, No. 3, p 315-316, 1969. 3 fig, 1 tab.

Descriptors: *Invertebrates, *Submerged plants, *Sampling, Laboratory equipment, Mollusks, Worms, Crustaceans, Insects.
Identifiers: Sample preparation, Weed sorter, Spiders.

An apparatus was constructed for separating aquatic invertebrates from submerged vegetation. After the collected samples were preserved in a 10 percent formalin solution for a week, portions were placed in the apparatus which consist of a specially designed container through which air and water flowed. The air provided agitation of the plants, and the water flow carried the organisms to a filter. Examination of the vegetation after treatment showed that the method was highly efficient in removing the organisms and much faster than manual methods. (Little-Battelle)
W71-11701

DETERMINATION OF NITRATE IN WATERS WITH THE NITRATE-SELECTIVE ION ELECTRODE,
Wisconsin Univ., Madison. Dept. of Soils.
D. R. Keeney, B. H. Byrnes, and J. J. Genson.
Analyst, Vol. 95, No. 1129, p 383-386, April 1970. 3 tab, 7 ref.

Descriptors: *Nitrates, *Nitrogen, *Electrodes, Chemical analysis, Groundwater, Surface waters.
Identifiers: Ion-selective electrodes.

The Orion selective-ion nitrate electrode for determination of nitrate-nitrogen in water was tested and the results compared with those obtained by phenoldisufphonic acid and steam distillation procedures. Recovery of added nitrate-nitrogen ranged from 83 to 105 percent with the ion electrode. However, results obtained on ground and surface-water samples were consistently lower than those obtained by the other two methods. The ion electrode may be useful for routine analysis of well and surface waters with nitrate-nitrogen concentrations above 10 mg/liter. (Little-Battelle)
W71-11702

DISSOLVED OXYGEN SAMPLER,
Wastewater Treatment Engineer, San Antonio, Tex.
For primary bibliographic entry see Field 07B.
W71-11703

EXPERIMENTAL ABSORPTION OF DIELDRIN BY CHLORELLA,
Florida Univ., Gainesville. Pesticide Research Lab.
Willis B. Wheeler.
Journal of Agricultural and Food Chemistry, Vol 18, No 3, p 416-419, May-Jun 1970. 1 fig, 2 tab, 8 ref.

Descriptors: *Chlorella, *Pesticide residues, Absorption, Carbon radioisotopes, Radiochemical analysis, Tagging, Cultures, *Dieldrin.
Identifiers: Chlorella pyrenoidosa.

insecticide absorption experiments were conducted by exposing Chlorella pyrenoidosa to 14C-labelled dieldrin. Flasks containing 150 ml of sterile Bristol's medium were inoculated chlorella and allowed to culture for four days prior to addition of dieldrin at an initial concentration of 0.3 ppm. Samples were taken at 0, 6, 12, 24, 36, 48, and 72 hours after the start of the uptake studies and analyzed. The analysis was carried out by multiply extracting the cells, digesting them, and analyzing the extractants and digested material with a scintillation counter. The absorption measurements showed that the quantity of radiolabeled dieldrin per cell increased with time. The labeled dieldrin became more difficult to extract with time indicating movement, perhaps into subcellular organelles. These two facts support the belief that dieldrin is absorbed by Chlorella. The results suggest that utilization of algae as a pesticide scavenger should be investigated. (Little-Battelle)
W71-11704

A NORTH AMERICAN TRICHOPTERAN LARVA WHICH FEEDS ON FRESHWATER SPONGES (TRICHOPTERA: LEPTOCERIDAE; PORIFERA: SPONGILLIDAE),
California Univ., Davis. Dept. of Water Science and Engineering.
D. R. Heiman and A. W. Knight.
The American Midland Naturalist, Vol 84, No 1, p 278-280, Jul 1970. 1 fig, 5 ref.

Descriptors: *Food chains, *Larvae.
Identifiers: *Trichoptera, Sponges, Athripsodes sp.

Larvae of the trichoptera Athripsodes sp, feed on the tissues and spicules of fresh water sponges. The verification was made by examining the gut contents of larvae which were apparently feeding on the aponges. (Little-Battelle)
W71-11705

RAPID DETECTION OF MICROORGANISMS IN AEROSPACE WATER SYSTEMS,
Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
G. V. Levin, E. Usdin, and A. R. Slonim.
Aerospace Medicine, Vol 39, p 14-16, Jan 1968. 2 fig, 2 tab, 5 ref.

Descriptors: *Bioluminescence, *Water pollution, Potable water, Assay, E coli, Chlorella, Protozoa, Fungi, Cultures, Clostridium, Pseudomonas, Streptococcus.
Identifiers: *Adenosine triphosphate, Corynebacterium striatum, Bacillus subtilis, Clostridium sporogenes, Streptococcus salivarius, Staphylococcus epidermidis, Pseudomonas fluorescens, Chlorella pyrenoidosa, Saccharomyces cerevisiae, Tetrahymena pyriformis.

Microbial contamination of water supplies, especially those in manned spacecraft, may be quickly detected by using the firefly bioluminescense assay for adenosinetriphosphate (ATP). The method involves extracting the microbial ATP from the water sample, inserting the extractant and reaction mixture in a light sensing instrument, injecting the sample into the reaction mixture, and measuring the peak light intensity which is proportional to the quantity of ATP present. It is possible to detect as little as .0000007 micrograms of ATP which is equivalent to about 100 cells of E. coli or one Tetraphymena cell. Experiments were conducted with several bacteria, an algae, a fungus, and a protozoa to establish the equivalence between amount of ATP and cell count. (Little-Battelle)
W71-11706

A CLOSED CULTURE VESSEL FOR COLONY COUNTS OF ANAEROBIC BACTERIA, WITH A NOTE ON ISOLATION FROM A MIXED POPULATION,
Agricultural Research Council, Babraham (England). Inst. of Animal Physiology.
R. W. White.
Laboratory Practice, Vol 19, No 2, p 180, 189, 1970. 1 fig, 5 ref.

Descriptors: *Isolation, *Anaerobic bacteria, Cultures, Sampling, Laboratory equipment.
Identifiers: Culturing vessels.

The design and use of a special flask for making colony counts of anaerobic bacteria is described. The vessel has a flat circular chamber 27 mm in diameter and 12 mm deep, with a capacity of 10-11 ml. The entrance tube is 40 mm long by 16 mm diameter. The vessel avoids the disadvantages of roll bottles which require continuous gas flow with consequent risk of contamination and difficulty of visual counting. A method is described for using the vessel for making colony counts and for isolating colonies from mixed populations. (Little-Battelle)
W71-11708

ENTEROPATHOGENIC ESCHERICHIA COLI SEROTYPES FOUND IN SEWAGE LAGOONS (WASTE STABILIZATION PONDS) IN NORTH DAKOTA,
North Dakota State Dept. of Health, Grand Forks. Div. of Labs.
Arthur A. Gustafson and James B. Hundley.
Health Laboratory Science, Vol 6, No 1, p 18-21, Jan 1969. 2 tab, 12 ref.

Descriptors: *E. coli, *Sewage lagoons, Isolation, Cultures, Sampling, Fluorescence, Domestic wastes, Industrial wastes, Sewage, Waste water treatment.
Identifiers: *Fluorescence antibody techniques.

Periodic samples from five sewage lagoons were collected by grab and a modified gauze pad techniques to determine the serotypes of E. coli present. Four of the lagoons were large and received domestic sewage; the fifth also received industrial wastes (potato). Two-hundred twenty-four samples were collected and 649 enteropathogenic E. coli isolated and identified by a combination of modified culture and fluorescent antibody techniques. All ten serotypes of enteropathogenic E. coli were identified. There appears to be a correlation between lagoon size and isolation rate; however, there was no significant difference in the isolation rate of the lagoon receiving industrial wastes compared to the others. The most frequently found serotype was 0124:B15 followed by 0124:B17. Serotype 086:B7 was least abundant. The studies suggest that sewage lagoons constitute a potential reservoir of enteropathogenic E. coli. (Little-Battelle)
W71-11709

BLACK SEA MICROORGANISMS GROWING ON HYDROCARBONS,
Institute of Biology of Southern Seas, Sevastopol (USSR).
O. G. Mironov.
Mikrobiologiya, Vol 38, No 4, p 608-610, Jul-Aug 1969. 1 tab, 10 ref.

Descriptors: *Oil wastes, *Pseudomonas, *Water purification, Cultures, Volumetric analysis, Industrial wastes, Domestic wastes, Sea water, Nutrients, Biodegradation, Isolation, Oil, Oily water.
Identifiers: *Hydrocarbons, Black Sea, Bacterium, Pseudobacterium, Vibrio, Achromobacter, Micrococcus, Bacillus, Spirillum, Sarcina, Bacterium cycloclastes, Bacterium aerophilium, Bacterium sulfureum, Bacterium album, Bacterium aliphaticum, Bacterium thalassium, Bacterium candicans, Pseudobacterium brevis, Pseudobacterium roseo-album, Pseudobacterium funduliformis, Pseudobacterium methylicum, Pseudobacterium biforme, Pseudobacterium cocciformis, Pseudobacterium desmolyticum, Pseudomonas sinuosa, Pseudomonas desmolyticum, Pseudomonas liquida, Pseudomonas radiobacter, Pseudomonas liquefaciens, Vibrio cunaetus, Vibrio adaptatus, Vibrio percolans, Vibrio aquatilis, Vibrio albis, Spirillum tenue, Achromobacter desmoliticum, Achromobacter tiogens, Achromobacter ubiduitum, Achromobacter fermentationes, Achromobacter ambiguum, Sarcina lutea, Micrococcus albatus, Micrococcus sphaeroides, Bacillus solidus.

From Black Sea water, microorganisms were isolated which are able to grow on petroleum

hydrocarbons and petroleum products as a sole source of carbon and energy. The microorganisms belong to the genera: Bacterium, Pseudobacterium, Pseudomonas, Vibrio, Achromobacter, Micrococcus, Bacillus, Spirillum, and Sarcina. This suggests participation of this group of microorganisms in the self-purification of petroleum products from sea water. It is also suggested that such self-purification may be inhibited by the entrance of other sources of organic matter into the sea. (Mortland-Battelle)
W71-11712

CHARACTERIZATION OF GAS OIL STOCKS: AN INTEGRATED ANALYSIS,
Arco Chemical Co., Philadelphia, Pa.
M. E. Fitzgerald, J. L. Moirano, H. Morgan, and V. A. Cirillo.
Applied Spectroscopy, Vol 24, No 1, p 106-114, January-February 1970. 5 fig, 9 tab, 15 ref.

Descriptors: *Oil industry, *Spectroscopy, *Chromotography, *Aromatic compounds, Separation techniques, Ultraviolet radiation, X-ray analysis, Sulfur.
Identifiers: *Oil characterization, Refineries, Mass spectroscopy, Liquid chromatography, Isoparaffins, Cycloparaffins, Paraffins, Hydrocarbons.

A combination of analytical techniques may be used to characterize gas oil stocks, either virgin, catalytically cracked, or a blend of both. Distillation data are determined by an Atlantic Vac-Assay. Sulfur content is determined by combustion or X-ray fluorescence techniques. Aromatic ring analysis is conducted by ultraviolet techniques. Mass spectrometer analysis of aromatic and nonaromatic fractions, which have been separated by a liquid chromatographic procedure, coupled with ultraviolet analysis and molecular sieve separation yields the percent of n-paraffins. Since sulfur compounds contribute to the uv spectrum, corrections can be made when the sulfur content is known. The integration of the data allows a complete characterization of the gas oil stocks. (Little-Battelle)
W71-11714

MICROBIAL DISTRIBUTION IN OCEAN WATER RELATIVE TO NUTRIENTS AND FOOD SOURCES,
California Univ., San Diego, La Jolla, Inst. of Marine Resources.
Osmund Holm-Hansen.
Available from the National Technical Information Service as CONF-700315-1, $3.00 in paper copy, $0.95 in microfiche. UCSD 10P20-73; Presented at the International Symposium on Biological Sound Scattering in the Ocean, Mar 31- Apr 2, 1970, Airlie House Conference Center, Warrenton, Virginia. 23 p. 4 fig, 31 ref.

Descriptors: *Bacteria, *Protozoa, *Nutrients, *Food chain, *Distribution patterns, Phaeophyta, Zooplankton, Dinoflagellates, Seawater, Phosphates, Biomass, Phytoplankton, Light penetration, Chlorophyll, Fluorometry, Organic matter, Carbon, Respiration, Nitrates, Copepods
Identifiers: Metozoa, Ceratium furca, Adenosine triphosphate.

The distribution and origin are discussed of organic substrates which may be important as food sources for the macro-zooplankton and other metazoans in deep ocean water. Adenosine triphosphate determinations indicate that there is a microbial population in deep water which contains between 1 to 5 percent of the total particulate organic carbon. The respiratory activity of this biomass is estimated to be about 10 to 50 microliters 02/liter/year, which compares favorably with respiratory estimates based on oxygen electrode measurements, electron transport activity, and heterotrophic CO2 uptake. The distribution of phytoplankton in the euphotic zone is discussed briefly as it is influenced by nutrients, light, or grazing. Field observations of phytoplankton biomass generally indicates concentrations of algal-carbon which are below those minimum concentrations required for good copepod growth as based on laboratory data. This disparity might be resolved if phytoplankton were distributed in patches or layers normally overlooked when determining chlorophyll concentrations with depth. Continuous chlorophyll profiles obtained by in vivo fluorometric measurements do indicate such a marked layering of algal cells. (Mortland-Battelle)
W71-11715

HEAT SHOCKED BACILLUS SUBTILIS SPORES AS AN INDICATOR OF VIRUS DISINFECTION,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
Gary H. Toenniessen, and Donald J. Johnson.
Journal of the American Water Works Association, Vol 62, No 9, p 589-593, Sep 1970. 1 fig, 2 tab, 17 ref.

Descriptors: *Enteric bacteria, *Sewage effluents, *Bioindicators, *Viruses, Water quality, Chlorination, Colorimetry, Cultures.
Identifiers: *Bacillus subtilis, Hepatitis.

It is suggested that water transmission of viruses can occur without detection because of an inability to culture viruses from dilute solution and because of the inadequacy of the coliform indicator for viruses. Experimental evidence is presented to show that Bacillus subtilis 8038 may be adapted as an index organism by lowering the spore's free chlorine resistance using the method of heat shock. It would be necessary to pretreat spores, add them to the water prior to or during treatment, and then assay their destruction at the end of the process. (Mortland-Battelle)
W71-11717

THE AUTOMATED DETERMINATION OF ALKYL ARYL SULFONATES IN SPRAY-DRIED DETERGENTS BY ULTRAVIOLET ABSORPTION,
Colgate-Palmolive Research Center, Piscataway, N.J.
E. H. Brandli, and R. M. Kelley.
Journal of the American Oil Chemists' Society, Vol. 47, No 6, p 200-202, Jun 1970. 1 fig, 2 tab, 8 ref.

Descriptors: *Detergents, *Sulfonates, *Automation, *Spectrophotometry, Ultraviolet radiation, Pumps, Surfactants, Instrumentation.
Identifiers: *Ultraviolet absorption, Alkyl aryl sulfonates.

An automated analytic system employing ultraviolet absorbance has been developed in response to a need for accurate control of alkyl aryl sulfonates in detergent production. The equipment includes a Technicon Solid Preparative Sampler for dissolving and diluting the sample and for removing an aliquot for analysis. The samples are continuously fed to a flow cell in a recording spectrophotometer by a proportioning pump. The method is completely automatic except for sample weighing, and analyses can be carried out at a rate of 10 samples per hour. Comparison of analyses by the automatic method and a manual method showed no significant differences in results. Replicate analysis of a single sample showed the automatic method to have a coefficient of variation of 3.5 percent. (Little-Battelle)
W71-11718

USE OF AUTOCYTOTOXIC BETA-D-GALACTOSIDES FOR SELECTIVE GROWTH OF SALMONELLA TYPHIMURIUM IN THE PRESENCE OF COLIFORMS,
Food and Drug Directorate, Ottawa (Ontario). Div. of Microbiology.
M. A. Johnston and H. Pivnick.
Canadian Journal of Microbiology, Vol 16, No 2, p 83-89, Feb 1970. 2 fig, 5 tab, 19 ref.

Descriptors: *Salmonella, *Bioindicators, *Cultures, Coliforms, Gas chromatography, E. coli, Pseudomonas, Hydrolysis, Growth rates, Inhibition, Isolation, Cultures.
Identifiers: Thin-layer chromatography, Salmonella typhimurium, Enterobacter aerogenes, Klebsiella pneumoniae, Citrobacter sp., Protenus vulgaris, Pseudomonas aeruginosa, Staphylococcus aureus, Lactose fermenting, Autocytotoxicity.

Selective inhibition of lactose-fermenting coliforms in the presence of Salmonella typhimurium was obtained by growing the mixed culture media containing certain synthetic Beta-D-galactosides. The inhibition resulted from autocytotoxicity affecting the coliforms but not S. typhimurium, and occurred with phenyl-)PG), phenethyl- (PEG), and 4-chloro-2-cyclopentylphenyl- (CPPG) Beta-D-galactosides. Strains of coliforms which were capable of undergoing autocytotoxicity yielded cell-free extracts that hydrolyzed PEG and CPPG, and these extracts also hydrolyzed the galactosidase assay compound, o-nitrophenyl Beta-D-galactoside (ONPG). They did not, however, hydrolyze o-nitrophenyl Beta-D-galactoside-6-phosphate (ONPG-6-PO4). A few strains of Enterobacter aerogenes and Klebsiella pneumoniae, although they fermented lactose, were not subject to autocytotoxicity. Cell-free extracts of these strains did not hydrolyze PEG, CPPG, or ONPG. They did, however, hydrolyze ONPG-6-PO4. In this respect galactosidase system resembles that of Staphylococcus aureus: extracts of S. aureus hydrolyze ONPG-6-PO4, but not ONPG. (Mortland-Battelle)
W71-11720

INSECTICIDE ADSORPTION ON ACTIVATED CARBON,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
Philip R. Goodrich, and Edwin J. Monke.
Transactions of the ASAE, Vol. 13, No. 1, p 56-57, 60, January-February 1970. 3 fig, 3 tab, 6 ref.

Descriptors: *Activated carbon, *Water purification, *Radioactivity techniques, Adsorption, Dieldrin, Carbon radioisotopes, Filtration, Insecticides, Pesticides.

Because of the potential hazard of insecticides being transferred from cow's milk to humans, carbon adsorption was investigated as a means of removing insecticides from animal drinking water. Using radioactive dieldrin as the contaminant, studies were conducted to determine the effectiveness of various sizes of granular activated carbon to remove small amounts of dieldrin from water, to determine the length of carbon filter necessary for adequate removal of insecticides, and to evaluate radio-tracer techniques for low level insecticide detection. Conclusions reached were: (1) Up to 99 percent of the insecticide applied to the filter was removed. (2) The size of carbon granules within the range tested (U.S. standard sieves 6 to 8, 8 to 10, 10 to 12, 12 to 14) was insignificant. (3) A filter column 280 mm in length removed more than 99 percent of the dieldrin in the water. (4) Radiotracer techniques, which are much simpler than other methods such as gas chromatography, gave very sensitive measurements of low insecticide levels. (Little-Battelle)
W71-11723

ADIABATIC VACUUM DISTILLATION TO FRACTIONATE PARAFFIN HYDROCARBON MIXTURES (C8-C14),
Atlantic Richfield Hanford Co., Richland, Wash.
Dawn L. Mulligan, and C. T. Stubblefield.
Available from the National Technical Information Service as ARH-1615, $3.00 in paper copy, $0.95 in microfiche. September 1969. 17 p. 12 fig.

Descriptors: *Distillation, *Gas chromatography, *Spectrophotometry, Chemical analysis, Trace elements, Nitrates.
Identifiers: *Paraffin, *Hydrocarbons.

In the Hanford Purex process of extraction of plutonium, uranium, and neptunium from the fission products, a solvent which is a mixture of normal paraffin hydrocarbons (NPH) serves as a diluent for the nitrates of plutonium, uranium, and neptunium in tri-n-butyl phosphate (TBP). Normal paraffin hydrocarbon is essentially a mixture of the straight-chain paraffins, between n-octane and n-tetradecane. The purpose of this research was to develop a scheme whereby a profile analysis of hydrocarbon composition would be established for any commercial product in the NPH class. Special emphasis was to be placed on establishing the relative amounts of the individual paraffin hydrocarbons, and on isolating and identifying impurities. Careful fractional distillation of NPH was to be used to isolate its constituents; gas-liquid chromatography (GC) and ultraviolet (UV) spectrophotometry were to be used to identify components. (McCann-Battelle)
W71-11725

ANALYSIS OF ARSENIC AND SELENIUM IN MARINE RAW MATERIALS,
G. Lunde.
Journal of the Science of Food and Agriculture, Vol. 21, No. 5, p. 242-247, May 1970. 5 fig, 3 tab, 21 ref.

Descriptors: *Arsenic compounds, *Trace elements, *Filtration, Gels, Oysters, Mussels, Herring, Clams.
Identifiers: *Selenium, *Arsenic, *Molecular gel filtration, Cod, Mackerel, Haddock, Squid, Whale.

The content of arsenic and selenium has been analysed in the following marine organisms: cod, herring, mackerel, Norway haddock, lobster, mussel, clam, oyster, squid, and whale. The analyses were performed both on the raw material and in the water-soluble phase after the samples had been boiled (the N liquor). An enrichment of arsenic is observed in the N liquor, compared with the raw material. The results indicate that selenium is also enriched in the N liquor and the water-soluble phase of the enzyme-hydrolysed presscake (the water-insoluble phase after boiling) were fractionated by molecular gel filtration. Fractions from these elutions were analysed for arsenic and selenium. Selenium was present in the fractions with a molecular weight above the 5000. Arsenic was connected with the lower molecular weight fractions, and may be present as more arseno-organic compounds. (Mortland-Battelle)
W71-11726

A SIMPLIFIED METHOD FOR QUANTITATIVE MICROBIOLOGICAL EXAMINATION OF DEEP FROZEN SEAFOODS,
Public Health Lab. Service, London (England).
N. J. Mitchell.
Journal of Applied Bacteriology, Vol. 33, No. 3, p 523-527, September 1970. 1 fig, 4 tab, 4 ref.

Descriptors: *Sampling, *Cultures, *Pathogenic bacteria, *Analytical techniques, E. coli, Shrimp, Lobsters, Isolation, Microbiology.
Identifiers: Staphylococcus aureus, Prawns.

Samples of frozen cooked or raw prawns, shrimp, and lobsters were examined by making total viable counts from homogenates and exuded tissue juices. Three methods were used to compare the analysis of juices with that of homogenates. The first method involved homogenization of the sample with separate counts made from the juice and the homogenate which had been diluted with 1/4 strength Ringer's solution. The second method consisted of making counts from the juice before homogenization and then from the homogenate. The third method involved taking two samples. Juice was examined from the one, and homogenate from the other. Total viable counts were made by the drop count method of Miles and Misra. Comparison of the counts taken on homogenates and on exuded juices shows that juice samples provide results as accurate as those from homogenized samples. Isolation of Staphytococcus aureus and Escherichia coli from exuded juices was also comparable to that of homogenate. Microbiological examination of juices eliminates the need to weigh samples and to use sterilized blenders for homogenization. (Little-Battelle)
W71-11727

CHEMICAL QUALITY OF WATER IN SOUTHEASTERN WYOMING.
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 07C.
W71-11784

TAXONOMIC GUIDES TO ARCTIC ZOOPLANKTON (I): AMPHIPODS OF THE CENTRAL ARCTIC - EUPHAUSIIDS OF THE ARCTIC BASIN AND PERIPHERAL SEAS,
University of Southern California, Los Angeles. Dept. of Biological Sciences.
John R. Tencati, and Yuk-Maan Leung.
Available from the National Technical Information Service as AD-714 247, $3.00 in paper copy, $0.95 in microfiche. Technical Report No 2 (1970), August 1970. 46 p, 2 fig, 35 ref.

Descriptors: *Amphipoda, *Arctic Ocean, Zooplankton, Classification.
Identifiers: Euphausiids, Laptev Sea, Barents Sea, Kara Sea, Lanceola clausi, Scina, Parathemisto abyssorum, Parathemisto libellula, Parathemisto gaudichaudii, Hyperoche medusarum, Hyperia galba, Hyperia medusarum, Gammarus wilkitzkii, Apherusa glacialis, Gammaracanthus loricatus, Eusirus cuspidatus, Eusirus holmii, Eusirogenes arctica, Andaniexis abyssi, Pseudalibrotus litoralis, Pseudalibrotus glacialis, Pseudalibrotus nanseni, Astyra longipes, Cyclocaris guilelmi, Eurythenes gryllus, Meganyctiphanes norvegica, Thysanoessa longipes, Thysanoessa longicaudata, Thysanoessa inermis, Thysanoessa raschii.

'Taxonomic guide to Arctic Zooplankton (I)' is the first of a series of practical taxonomic guides to zooplankton in preparation to meet the needs of people who are not taxonomists, but are involved with arctic fauna. The work is based upon results of research by investigators associated with this project and its precursors since 1952. Twenty-one species of adult, Central Arctic, non-benthic amphipods found in collections of plankton and under-ice fauna from Ice Stations T-3, ARLIS I, and ARLIS II are presented. Five species of euphausiids collected in the Central Arctic from T-3, ARLIS I, and ARLIS II, and in the Chukchi, East Siberian, and Laptev Seas by the USCGC Northwind and in the Barents and Kara Seas by the USCGC Eastwind are considered. Dichotomous keys, pertinent illustrations, useful references as well as notes on distribution, and morphology are provided. (McCann-Battelle)
W71-11822

BIOLOGICAL HANDBOOK FOR ENGINEERS.
National Aeronautics and Space Administration, Huntsville, Ala. George C. Marshall Space Flight Center.

NASA Contractor Report 61237, June 1968. 225 p, 64 fig, 74 tab, 146 ref.

Descriptors: *Microbiology, *Classification, *Cultures, *Bioassays, Protozoa, Bacteria, Fungi, Viruses, Algae, Lichens, Actimomycetes, Cytological studies, Filtration, Ultrasonics, Disinfection, Sampling, Centrifugation, Sedimentation, Chemical precipitation, Life cycles, Genetics, E. coli, Isolation.
Identifiers: Rickettsiae, Sterilization, Bacillus subtilis, Bacillus stearothermophilus, Proteus vulgaris, Pseudomonas aeruginosa, Staphylococcus aureus, Lactobacillus casei, Bacillus thuringiensis, Agars, Staphylococcus epidermidis, Micrococcus, Streptococcus, Brevibacterium, Corynebacterium, Electrostatic precipitation, Thermal precipitation.

Useful microbiological background information has been compiled in a handbook for engineers and scientists working on bio-related projects. It is intended as an aid in: (1) evaluating the effects of engineering procedures on microbial life; (2) determining the effects of decontamination of sterilization procedures on the performance of an overall system; and (3) understanding the language of microbiologists. The information presented covers such subjects as: (1) the various categories of microorganisms, their physical characteristics, their relative abundances in various locations, their life cycles, and their genetics; (2) the methods and applications of decontamination and sterilization by wet or dry heat, chemical treatment, radiation exposure, and pressure treatment; (3) the relative success of various methods of contamination control, such as filtration, clean rooms, laminar air flows, and shielding; and (4) the theory and techniques of bioassay--the detecting, identifying, and counting of microbes in specific locations. The final section comprises a glossary of common microbiological terms. The many references cited throughout the work guide the interested reader to additional information. (Mortland-Battelle)
W71-11823

PRODUCTION OF ACETOIN AND DIACETYL BY THE GENUS SALMONELLA,
Dept. of Agriculture, Albany, Calif. Western Regional Research Lab.
J. A. Garibaldi, and H. G. Bayne.
Applied Microbiology, Vol. 20, No. 6, p 855-856, December 1970. 11 ref.

Descriptors: *Salmonella, Cultures, Isolation, Microbiology, Bacteria.
Identifiers: *Acetoin, Salmonella typhimurium, Salmonella cerro, Salmonella senftenberg, Salmonella milwaukee, Salmonella macallen, Salmonella montevideo, Salmonella urbana, Salmonella memphis, Salmonella albuquerque, Salmonella mission, Salmonella newport, Salmonella barielly, Salmonella heidelberg, Salmonella choleraesuis var kunzendorf, Salmonella oranienburg, Salmonella worthington, Salmonella bleadon, Salmonella meleagrandis, Salmonella derby, Salmonella anatum, Salmonella asutin, Salmonella tennessee, Salmonella blockey, Salmonella thompson, Salmonella gallinarum, Salmonella pullorum, Salmonella sendai, Salmonella dublin, Diacetyl.

One of the characteristics used to define the genus Salmonella is its inability to produce acetoin. However, experiments with 42 members of the genus showed that Salmonella do under slightly different nutrional conditions produce acetoin or diacetyl or both. They do not produce amounts detectable by the Voges-Proskauer test under the nutrional conditions of the MR-VP medium. However, when the bacteria were cultured on a minimal medium containing 1 percent glucose, abundant amounts were produced. The limiting factors in the accumulation of acetoin by Salmonella have not yet been determined. (Little-Battelle)
W71-11827

DIRECT DETERMINATION OF NICKEL IN GAS OILS AND PETROLEUM DISTILLATION RESIDUES BY ATOMIC FLUORESCENCE SPECTROSCOPY IN A SEPARATED AIR-ACETYLENE FLAME,
Technical Univ. of Prague (Czechoslovakia). Dept. of Analytical Chemistry.
Vaclav Sychra, and Jaroslav Matousek.
Analytica Chimica Acta, Vol. 52, No. 2, p 376-379, November 1970. 1 fig, 1 tab, 10 ref.

Descriptors: *Spectroscopy, *Fluorescence, *Oil, *Trace metals.
Identifiers: *Nickel, Atomic fluorescence spectroscopy, Petroleum characterization, Oil residues.

Atomic fluorescence spectroscopy, using a separated air-acetylene flame, was used to determine the amount of nickel in gas oils and petroleum distillation residues. In a xylene solution, the detec-

tion limit was 0.007 p.p.m. and the working curve was linear up to 5 p.p.m. of nickel. Results obtained by atomic fluorescence spectroscopy, direct atomic absorption, and atomic absorption spectroscopy of mineralized samples were in good agreement. A nitrogen-sheathed, air-acetylene flame was found to be the most suitable flame for direct determination. In the oil solutions, the detection limits were about 0.01 p.p.m. The main advantage of this technique over atomic absorption is the fact that no correction for nonspecific molecular absorption and light-scattering is needed. (Mortland-Battelle)
W71-11833

THE DETERMINATION OF MICROGRAM QUANTITIES OF MERCURY (II) AND SILVERY (I) BY THERMOMETRIC TITRATION,
Leeds Univ. (England). Dept. of Inorganic and Structural Chemistry.
K. C. Burton, and H. M. N. H. Irving.
Analytica Chimica Acta, Vol. 52, No. 3, p 441-446, December 1970. 1 fig, 3 tab, 10 ref.

Descriptors: *Heavy metals, *Volumetric analysis, *Aqueous solutions, Ions, Automation, Chlorides.
Identifiers: *Mercury, *Silver, Thermometric titration.

By titration with standard potassium, iodide silver (I) and mercury (II) can be determined in aqueous solution in the concentration range 1000-0.1 p.p.m. The endpoint, which is detected thermometrically and recorded, is indicated by the heat liberated in the reaction between arsenic (III) and cerium (IV) which is catalysed by traces of iodide ion. The basic procedure is as follows. A stirred solution of the sample containing silver or mercury (II) ions and a fixed amount of As (III)-Ce (IV) indicator solution is titrated with standard potassium iodide solution. Immediately after the end-point, the excess of iodide ion catalyses the indicator reaction and the rise in temperature is detected by a thermistor probe in a Wheatstone bridge circuit. By using a mechanically driven syringe burette to deliver the titrant at a constant rate and by displaying the out-of-balance signal from the bridge circuit on a chart recorder, after suitable filtering and amplification, the procedure can be made semi-automatic. (Mortland-Battelle)
W71-11836

CHROMATOGRAPHIC SEPARATION OF SILICATE AND PHOSPHATE,
Rhode Island Univ., Kingston. Narragansett Marine Lab.
Michael E. Q. Pilson, and Robert J. Fragala.
Analytica Chimica Acta, Vol. 52, No. 3, p 553-555, December 1970. 5 ref.

Descriptors: *Silicates, *Phosphates, *Separation techniques, Chromatography.

Various combinations of reagent strength and acidity were examined, and spray reagents which are specific for either phosphate or silicate were developed. The separation method described uses a phosphate specific spray of 1 percent ammonium molybdate in 0.6 M hydrochloric acid, followed by 1 percent tin (II) chloride in 10 percent hydrochloric acid and a silicate psecific spray of 1 percent ammonium molybdate in 0.125 M sulfuric acid, followed by saturated oxalic acid and 1 percent tin (II) chloride in 10 percent hydrochloric acid. The procedure is as follows. Glass plates with an Ecteola Cellulose support (0.6 mm) are washed in an isopropanol-water-acetic acid (20:5:2) solution. The sample solution is applied in a quantity of 1 or 2 microliters and the spots dried. After allowing the solvent to run to 100 mm, the plates are dried and sprayed with each reagent in turn. The plates are allowed to dry between each spray reagent. With this method, phosphate stays at or near the origin, and silicate runs as a fairly discrete spot with an R sub F value of about 0.25. Phosphate may be visualized with the phosphate spray reagents, and silicate does not react. The reverse is true for silicate spray reagents. The lowest concentration of silicate that can be detected when 1 microliter is applied is 0.006 microgram. (Mortland-Battelle)
W71-11837

PROBLEMS IN WATER ANALYSIS FOR PESTICIDE RESIDUES,
Hawaii Univ., Honolulu. Dept. of Agricultural Biochemistry.
A. Bevenue, T. W. Kelley, and J. W. Hylin.
Journal of Chromatography, Vol. 54, No. 1, p 71-76, January 6, 1971. 1 fig, 1 tab, 13 ref.

Descriptors: *Gas chromatography, *Pesticide residues, *Pollutant identification, Heptachlor, Aldrin, DDT, Silica, Gels, Organic matter, Solvents, Plastics, Cellulose.
Identifiers: *Thin-layer chromatography, DDE, DDD, Heptachlor epoxide, Glass, Chemical interference.

When water samples are analyzed for pesticide residues by means of gas chromatography, some samples will contain non-pesticide chemicals that possess analytical characteristics similar to some pesticides. False data also may be acquired from extraneous sources in the analytical laboratory. This report reviews some of these problems. Sources of contaminants that may interfere with analysis in the parts per billion range include organic solvents, glassware, plastic ware, cellulose extraction thimbles, filter paper, and silica gels. Prior to their use, heat treatment of the glassware and silica gels is recommended to eliminate contaminants. Plastic ware and filter paper should not be included in the analytical procedure. (Mortland-Battelle)
W71-11838

DETERMINATION OF SULPHUR IN PETROLEUM PRODUCTS BY X-RAY SPECTROSCOPY - INTERNAL STANDARD METHOD,
Shell Research Ltd., Chester (England). Thornton Research Centre.
R. W. Toft.
Journal of the Institute of Petroleum, Vol. 56, No. 551, p 269-273, September 1970. 1 fig, 4 tab.

Descriptors: *X-ray spectroscopy, *Sulfur, *Oil.

The standard X-ray method (ASTM D2622-67) for sulfur in petroleum products has two major disadvantages: 1) It is less accurate if the total mass absorption coeffieicnt for S K alpha radiation of the sample differs from that of the standard. 2) There is no correction for the absorption of S K alpha radiation by sulfur and many standard solutions are required to establish the calibration curve. An X-ray spectroscopic method has been developed which avoids these limitations. This method allows the determination of sulphur in any petroleum product by comparison with a single standard, which may conveniently be prepared from a pure sulphur compound. Lead, as the napthenate, is added in known amounts to both sample and standard. The observed intensity of the Pb M alpha X-ray spectral line is used as an internal standard to correct the intensity of the observed S K alpha line for the effect of differences in composition between sample and standard. The method has been compared for accuracy and repeatability with existing standard methods and is acceptable on both counts. (Little-Battelle)
W71-11840

OIL POLLUTION OF THE OCEAN,
Woods Hole Oceanographic Institution, Woods Hole, Mass.
Max Blumer.
Reference No. 70-46, 6 p, September 1970. 1 fig, 10 ref.

Descriptors: *Oil wastes, *Water pollution effects, Toxicity, Aromatic compounds, Seawater, Food chain, Detergents, Pollutant identification, Water pollution control, Oil.
Identifiers: Sargasso Sea, Hydrocarbons, Crude oil.

Several aspects are reviewed of the oil pollution problem beginning with an analysis of the extent of marine oil pollution. Oil influx into the sea from shipping bases alone is about 10 to the 12th power g/year. Other causes like influx from sewage and incomplete combustion may boost this figure substantially. The immediate biological effects of oil pollution are discussed from the standpoint of crude oil composition and the relative toxicity of its fractions. Long-term effects on the total marine ecology are also considered. Countermeasures against oil pollution are reviewed with the conclusion that burning, where possible, or containment and rapid recovery are the only acceptable solutions in the case of large spills. (Mortland-Battelle)
W71-11843

NITROGEN AND CARBON DISTRIBUTION IN SEDIMENT CORES OF SELECTED WISCONSIN LAKES,
Wisconsin Dept of Natural Resources, Madison; and Wisconsin Univ., Madison, Dept of Soil Science.
John G. Konrad, Dennis R. Keeney, Gordon Chesters, and Kuan-Lin Chen.
Journal Water Pollution Control Federation, Vol. 42, No. 12, p 2094-2101, December 1970. 5 tab, 16 ref.

Descriptors: *Eutrophication, *Nitrogen, *Carbon, *Dredging, Nutrients, Wisconsin, Trophic level, Lakes, Core drilling, Analytical techniques, Separation techniques, Calcium carbonate, Ammonia, Sediments, Distillation, Nitrates, Distribution patterns, Nitrites.
Identifiers: *Sediment cores, *Sample preservation, Kjeldahl procedure, Clastics, Total organic carbon, Lake Mendota (Wisconsin), Lake LaBelle (Wisconsin), Lake Trout (Wisconsin), Lake Minocqua (Wisconsin).

The objectives of this program were to evaluate the use of sediment nitrogen distribution data to reflect cultural eutrophication and the feasibility of decreasing the nitrogen status of Wisconsin lakes by dredging. Two hardwater and two softwater lakes were chosen for investigation. Sediment cores were taken while the lakes were still ice covered using a piston-type coring device. Total, organic, and inorganic carbon were determined by a microcombustion procedure. Total nitrogen was determined by a semimicro Kjeldahl procedure and fixed ammonium-nitrogen by a KOBr-Hf method. Other techniques were used to determine exchangeable ammonium-nitrogen, water-soluble ammonium nitrogen, nitrate-nitrogen, total soluble ammonium-nitrogen, clastics content, and organic matter content. The results showed that it is difficult to obtain striking evidence of cultural eutrophication by use of carbon and nitrogen distribution data. Total and available nitrogen levels were quite high in all profiles, and available nitrogen tended to increase with depth, indicating that dredging operations would not be suitable for reversing the nitrogen status of these or similar lakes. (Mortland-Battelle)
W71-11845

POLAROGRAPHIC OXYGEN ANALYZER RESPONSE: THE EFFECT OF INSTRUMENT LAG IN THE NON-STEADY STATE REAERATION TEST,
Washington Univ., Seattle. Dept. of Chemical Engineering.
Andrew A. Benedek, and William J. Heideger.
Water Research, Vol. 4, p 627-640, September 1970. 6 fig, 3 tab, 12 ref.

Descriptors: *Polarographic analysis, *Reaeration, *Test procedures, Oxygen, Aeration, Mathematical models, Electrochemistry, Electrodes.
Identifiers: Bio-oxidation.

The response characteristics of a polarographic oxygen analyzer are determined both theoretically and experimentally. A simplified diffusion theory adequately describes response of the polarographic probe to a step change as well as to an exponential

change. Minor disagreements are believed to have been due to sideways diffusion, membrane laxity, and anode contamination. The polarographic probe used in this study was capable of a response in the unsteady state aeration test which was repeatable to within 2 per cent or better. Slow instrument response can cause unsteady state aeration test results to appear low. This error increases with both the aeration rate and the probe membrane thickness. It is shown that substantial errors could be introduced by the use of such an analyzer and a test procedure is suggested to evaluate their significance. (McCann-Battelle)
W71-11846

A RAPID METHOD FOR THE ESTIMATION OF TRACE AMOUNTS OF KEROSENE IN EFFLUENTS,
British Columbia Research Council, Vancouver. Div. of Applied Biology.
E. G. H. Lee, and C. C. Walden.
Water Research, Vol. 4, p 641-644, September 1970. 2 fig, 1 tab, 9 ref.

Descriptors: *Oil wastes, *Separation technique, Effluents, Distillation, Aqueous solutions, Oily water, Industrial wastes.
Identifiers: *Hydrocarbons, Acetone, Kerosene, Carbon adsorption.

A rapid method for determination of hydrocarbons in aqueous solution in the range of 10-100 mg/l or more is described. The method involves separating and concentrating the hydrocarbons by adsorption on activated carbon. After removal of excess water from carbon by vacuum, the adsorbed hydrocarbons are then eluted quantitatively with acetone. The turbidity developed in the eluate with an acid-lauryl sulfate reagent is proportional to the original concentration of hydrocarbons in the aqueous solution. (Mortland-Battelle)
W71-11847

LEVELS OF PRODUCTION IN THE PELAGIC ENVIRONMENT OF THE STRAIT OF GEORGIA, BRITISH COLUMBIA: A REVIEW,
Fisheries Research Board of Canada, Nanaimo (British Columbia). Biological Station.
T. R. Parsons, R. J. LeBrasseur, and W. E. Barraclough.
Journal Fisheries Research Board of Canada, Vol. 27, No. 7, p 1251-1264, July 1970. 5 fig, 4 tab, 42 ref.

Descriptors: Nutrients, Zooplankton, Larval growth stage, Aquatic productivity, Irradiation, Silicates, Nitrates, Phosphates, Seston, Carbon, Nitrogen, Chlorophyll, Herring, Chinook salmon, Phytoplankton, Diatoms, Copepods, Water pollution effects, Solar radiation, Primary productivity.
Identifiers: Strait of Georgia (British Columbia), Cod, Lingcod, Flatfish, Rockfish, Dogfish, Coho salmon, British Columbia.

This general description of biological production in the Strait of Georgia is intended to serve as a basis for evaluating subsequent change in productivity such as might be caused by sustained pollution of this environment. Data have been accumulated on seasonal levels of nutrients, primary production, and zooplankton. The occurrence and abundance of larval fish in the surface layers have been reported together with an approximate estimate of the standing stock of commercially exploited fish. The results indicate that beyond local effects, the Strait of Georgia is comparable in productivity to other nearshore waters at the same latitude. The total primary productivity of the waters was found to be approximately 120 g C/squared meter per year, but a high degree of areal patchiness in all production data emphasize the necessity of basing predictions about particular subareas on knowledge specific to the subareas in question. At the time of the study, there was no apparent influence of pollution on the pelagic production of the Strait of Georgia. (Little-Battelle)
W71-11850

THE ISOLATION AND OCCURRENCE OF HYALOCHLORELLA MARINA,
California Univ. Berkeley. Microbiology Group; and California Univ; Berkeley. Dept. of Botany.
R. O. Poyton.
Journal of General Microbiology, Vol. 62, Part 2, p 189-194, August 1970. 2 tab, 13 ref.

Descriptors: *Marine fungi, *Isolation, Algae, Separation techniques, Atlantic Ocean, Pacific Ocean, Gulf of Mexico.
Identifiers: *Hyalochlorella marina, Rhodomela sp., Endocladia sp., Phyllospadex sp., Microcladia sp., Cladophora sp., Polysiphonia sp., Gelidium sp., Chlorella, Agars.

Five methods were evaluated for isolation of Hyalochlorella marina from a marine environment. The methods were: (1) Filamentous algae collected from intertidal and eulittoral zones was placed in isolation medium containing 370 units of streptomycin sulfate/ml and 825 units penicillin 'G' sodium/ml. (2) Sea water was centrifuged and the concentrate plated onto the isolation medium. (3) Sea water and marine mud suspensions were prefiltered to remove large mud particles and debris, filtered through a sterile nucleopore membrane filter, and the filters incubated on the isolation medium. (4) Sea water was seeded with pollen grains and observed after 4, 7, and 10 days for Hyalochlorella filaments. (5) Microscope slides were immersed at various depths in the marine environment and examined for Hyalochlorella growth at various time intervals. The latter two methods provided no satisfactory results in the experiments. The first three methods proved effective for isolation of Hyalochlorella marina. These methods showed that this organism occurs in nature both attached to algal filaments and free floating. However, the concentration of organisms on algal surfaces was 300 to 13,000 times that of free-floating organisms in an equivalent amount of sea water. Additional investigation of the effect of antibiotics on the viability of Hyachlorella marina showed that viable counts were the same with or without penicillin and/or streptomycin. (Little-Battelle)
W71-11851

SIMULTANEOUS GRAVIMETRIC MICRODETERMINATION OF CHLORINE AND MERCURY IN ORGANIC MATERIALS, (Gleichzeitige gravimetrische mikrobestimmung chlor und quecksilber in organischen substanzen),
Istituto Superiore di Sanita, Rome (Italy). Microanalytical Section.
M. Marzadro, and J. Zavattiero.
Mikrochimica Acta, p 1261-1267, 1969. 1 fig, 1 tab, 6 ref.

Descriptors: *Gravimetric analysis, *Chlorine, Organic compounds, Heavy metals, Absorption.
Identifiers: *Mercury.

The chlorine and mercury contents of organic substances can be determined simultaneously by combustion of the substance in a rapid stream of oxygen and absorption of the chlorine and of the mercury on silver screening at 540 degrees and on silver sponge at around 60 degrees, respectively. The analysis requires 45 minutes. The margin of error of the determination for chlorine and also for mercury is plus or minus 0.3 percent for all the compounds examined. (Little-Battelle)
W71-11853

MARINE ALGAE OF THE SOLOMON ISLANDS,
Adelaide Univ. (Australia). Dept. of Botany.
H. B. S. Womersley, and A. Bailey.
Philosophical Transactions of the Royal Society of London, Vol. 259, No. 830, p 257-261, September 10, 1970. 1 fig.

Descriptors: *Chlorophyta, *Phaeophyta, *Rhodophyta, *Cyanophyta, Systematics, Benthic flora.
Identifiers: Solomon Islands, Macrophytes.

An account is given of the benthic marine algae and sea grasses collected on the 1965 Royal Society Expedition to the Solomon Islands. (Little-Battelle)
W71-11854

THE PAPER AND THIN-LAYER CHROMATOGRAPHY OF SEVERAL S-TRIAZINE DERIVATIVES (Uber papier und dunnschichtchromatographie einiger s-triazinderivate),
Ljubljana Univ. (Yugoslvia). Inst. of Chemistry.
J. Perkavec, J. Perpar, and D. Brodnik.
Mikrochimica Acta, p 1224-1228, 1969. 2 fig, 3 tab.

Descriptors: *Chromatography, Triazine pesticides.
Identifiers: Thin-layer chromatography, Metabolites.

The paper- and thin-layer chromatography of several s-triazine derivatives has been described. A new method was used to render the flecks visible; it is based on the reaction of the s-triazine derivatives with diphenylamine. The influence of the substituents on the triazine ring on the migration velocity was investigated. Some Rf-values were given. (Little-Battelle)
W71-11855

POPULATION DESCRIPTION OF THE NON-METHANOGENIC PHASE OF ANAEROBIC DIGESTION: I. ISOLATION, CHARACTERIZATION AND IDENTIFICATION OF NUMERICALLY IMPORTANT BACTERIA,
National Inst. for Water Research, Pretoria (South Africa).
D. F. Toerien.
Water Research, Vol 4, p 129-148, 1970. 8 fig, 14 tab, 85 ref.

Descriptors: *Anaerobic digestion, *Anaerobic bacteria, *Isolation, Waste water treatment, Cultures, Carbohydrate fermentation, Clostridium, Lactobacillus, Actinomycetes, Systematics, Bacterial classification, Bacterial isolation, Biochemical tests, Methanogenesis, Microbial populations, Microaerophiles, Morphology, Physiological characteristics.
Identifiers: Spirilla, Spirochetes, Cornynebacteria, Ramibacteria, Bifidobacteria, Eubacteria, Bacteroides, Sphaerophorus, Fusobacteria, Vibrio, Veillonella, Peptococcus.

Ninety-two numerically important bacterial cultures were isolated from anaerobic digesters and were characterized. These cultures were all obligate anaerobes or microaerophiles. Rod-shaped bacteria pre-dominated while cocci, spirilla, and crescent-shaped bacteria were less frequently encountered. Identification of the isolates to the generic level was difficult and in some cases impossible. Identification of isolates from the anaerobic digestion ecosystem as a means of population description therefore seems to have little value. (Little-Battelle)
W71-11875

DESIGN OF A POLAROGRAPHIC DETECTOR FOR HIGH SPEED, HIGH EFFICIENCY LIQUID CHROMATOGRAPHY IN COLUMNS AND ITS EVALUATION FOR THE QUANTITATIVE ANALYSIS OF PESTICIDES,
Amsterdam Univ., (Netherlands). Lab. for Analytical Chemistry.
J. G. Koen, F. K. Huber, Huber H. Poppe, and G. den Boef.
Journal of Chromatographic Science, Vol 8, p 192-199, April 1970. 9 fig, 4 tab, 18 ref.

Descriptors: *Chromatography, *Polarographic analysis, *Pesticides.
Identifiers: *Parathion, Methyl parathion, *p-nitrophenol, Quantitative analysis, Microdetector.

The construction is discussed of a microdetector, based on the principle of polarography with a dropping mercury electrode, for high speed, high efficiency liquid chromatography in columns. The sensitivity, noise, linear dynamic range, and speed of response of the equipment are also discussed. The polarographic detector has been applied to the analysis of a mixture of parathion, methyl parathion and p-nitrophenol. Concentrations in the order of 10 to the minus 8th power mol/l can be determined in a few minutes. In quantitative analysis a standard deviation of better than 2 percent can be obtained. The detection limit can probably be decreased further with more sophisticated equipment and with an indicator electrode having a larger current yield. The method can be applied not only to compounds which are either reduced or oxidized themselves at the DME, but also to compounds which give rise to a catalytic wave. Surface active compounds also give a signal. (McCann-Battelle)
W71-11880

FURTHER STUDIES ON LONG TERM PRESERVATION OF MARINE BACTERIA,
Torry Research Station, Aberdeen (Scotland).
Mary A. Greig, Margaret S. Hendrie, and J. M. Shewan.
Journal of Applied Bacteriology, Vol. 33, No. 3, p 528-532, September 1970. 2 tab, 6 ref.

Descriptors: *Bacteria, *Preservation, *Cultures, Freezing.
Identifiers: *Sample preservation, Corynebacteria, Micrococci, Vibrio, Photobacteria, Achromobacter sp., Aeromonas formicans, Pseudomonas, Serratia marinorubra, Spirillum spp.

Total viable counts were made on 49 strains of bacteria (44 marine and 5 nonmarine) which had been freeze dried in 1958 and subsequently stored at room temperature. Viability checks were also performed on the organisms which, in addition to having been freeze dried in 1958, had also been suspended in glycerol-nutrient broth and stored in the frozen (-29 degrees) state. After 10 years, 9 percent of the cultures in the freeze dried form and 41 percent of those stored in glycerol-nutrient broth at -29 degrees were nonviable. The highest viable counts were found among the corynebacteria and micrococci, the lowest with the vibrios and photobacteria. (McCann-Battelle)
W71-11884

AEROBIC BACTERIAL FLORA OF THE BAHAMA BANK,
University of Strathclyde, Glasgow (Scotland). Dept. of Applied Microbiology.
May F. McCallum.
Journal of Applied Bacteriology, Vol. 33 No. 3, p 533-542, September 1970. 2 fig, 4 tab, 19 ref.

Descriptors: *Calcium carbonate, *Sediments, *Sea water, *Pseudomonas, Cores, Cultures, Plant morphology, Sulphates, Nitrates, Salinity, Diagenesis, Sampling, Isolation, Bacteria.
Identifiers: Bahama Bank, Bimini, Andros Island, Vibrio, Cytophaga, Flavobacterium, Chromobacterium violaceum, Bacillus, Corynebacterium, Streptomyces, Micrococcus, Staphylococcus, Gram negative rods.

The types of bacteria isolated from carbonate sediments of Bimini and off the West Coast of Andros Island are reported. The majority of 225 cultures examined were gram negative rods of the genera Vibrio and Pseudomonae. There is a possibility that the bacterial flora may be correlated with diagenesis of sediments and emergence from the marine environment. There was no apparent correlation between the type of bacterial flora and the salinity of the lagoon water. The basic flora were marine, but there were organisms present in the emerging sediments covered by mangrove that are normally found in soil. Most of the cultures found at Andros Island could precipitate calcium carbonate from sea water. (Mortland-Battelle)
W71-11885

OBSERVATIONS ON CERTAIN ENVIRONMENTAL FEATURES AT THE DONA PAULA POINT IN MARMUGAO BAY, GOA,
National Inst. of Oceanography Pangim (India).
Padmakar V. Dehadrai.
Indian Academy of Science, Proceedings, Vol. 73, No. 3, Section B, p 56-67, August 1970. 7 fig, 11 ref.

Descriptors: *Estuaries, *Aquatic productivity, *Water properties, Water temperature, Hydrogen ion concentration, Salinity, Turbidity, Light penetration, Monsoons, Phytoplankton, Diurnal, Tidal effects, Sampling, Analytical techniques, Zooplankton, Copepods, Dissolved oxygen, Seasonal, Precipitation (Atmospheric), Runoff, Primary productivity.
Identifiers: Zuari River (India), Marmugao Bay (India), Arabian Sea.

The Marmugao Bay, which is an estuary of the river Zuari, showed marked seasonal changes in temperature, pH, salinity, oxygen, turbidity and light penetration. These are largely induced by the south-west monsoon. Primary productivity showed a similar seasonal pattern and increased by about two to three times during pre-monsoon and post-monsoon months. Fluctuations in the phytoplankton abundance seem related to the cycle of primary productivity. Short-term changes in some of these parameters induced by the tides and day and night conditions were well marked. These are also considerably influenced by the local precipitation and land run-off during the south-west monsoon. (Mortland-Battelle)
W71-11886

DISTRIBUTION AND ABUNDANCE OF TUBIFICID (OLIGOCHAETA) SPECIES IN TORONTO HARBOUR, LAKE ONTARIO,
Toronto Univ. (Ontario). Dept. of Zoology.
R. O. Brinkhurst.
Journal of the Fisheries Research Board of Canada, Vol. 27, No. 11, p 1961-1969, November 1970. 7 fig, 3 tab, 8 ref.

Descriptors: *Oligochaetes, *Water pollution effects, *Bioindicators, Lake Ontario, Sediments, Cores, Sampling, Coliforms, Biochemical oxygen demand, Dissolved oxygen, Nitrogen, Phosphorus, Great Lakes, Diurnal distribution, Distribution patterns, Analytical techniques.
Identifiers: Don River (Canada), Tubificids, Tubifex tubifex, Limnodrilus hoffmeisteri, Peloscolex multisetosus, Limnodrilus udekemianus, Limnodrilus cervix, Limnodrilus claparedeanus, Anlodrilus pluriseta, Potamothrix vejdovskyi, Potamothrix hammoniensis.

The relation between the worm population and certain constituents of the sediment in Toronto Harbour of Lake Ontario was studied. The distribution and abundance of species present and some data on dry weight distributions are discussed. Four samples were taken at each of 43 stations with a KB corer (5-cm diameter). Total coliform counts, BOD, dissolved oxygen, and nitrogen and phosphorus values were taken from earlier studies. The tubificid oligochaetes build up populations in excess of 200,000/m2. Pollution-tolerant species in great abundance are located around the mouth of the Don River, whereas small numbers and some less tolerant species are found near the island shores. There is no evidence of diurnal rhythms in the vertical distribution of the worms in the sediment. Dry weights for tubificids are about 16 percent of the wet weight from fresh-starved worms. The ash content averaged 34 percent of the contents. The results of this survey confirm the view that the tubificids can be used as indicators of organic pollution. (Mortland-Battelle)
W71-11887

SPATIAL HETEROGENEITY OF PHYTOPLANKTON IN A NEAR-SHORE ENVIRONMENT,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
Trevor Platt, Lloyd M. Dickie, and Ronald W. Trites.
Journal of the Fisheries Research Board of Canada, Vol. 27, No. 8, p1453-1473, August 1970. 9 fig, 4 tab, 10 ref.

Descriptors: *Phytoplankton, *Spatial distribution, *Statistical methods, Distribution patterns, Chlorophyll, Sampling, Fluorometry, Statistical models, Phosphates, Water temperature, Salinity.
Identifiers: *Analysis of variance, *Data interpretation, St. Margaret's Bay (Canada), Sample preservation.

An analysis of variance model for phytoplankton distribution is described which allows the partition of the variance of chlorophyll observations into effects due to differences between stations, to differences between replicate samples at the same station, and to handling and analytical error. When the model was applied to observations of chlorophyll made in St. Margaret's Bay, N.S., it was found that, on the average, the variance between replicate samples on the same station was of the same magnitude as the analytical error variance. Significant differences were revealed between stations even at densities as high as 10 stations per 0.0625 sq miles. As the sampling area was increased (but the number of stations kept constant), the between-station variance rose rapidly, to a density of 10 stations per sq mile, after which it remained relatively constant. Analysis of chlorophyll samples taken at closely spaced stations (0.1 miles apart) along an 8-mile transect revealed considerable variability in distribution. Autocorrelation analysis of the data showed the presence of plankton patches 0.5-1.5 miles in diameter. Coherence analysis provided some evidence for correlation between the distribution of chlorophyll and of temperature and salinity. Measurements taken at nine stations during the course of a plankton bloom showed that although there were differences between the stations, the time variation in chlorophyll concentration followed broadly the same course at all the stations. (Mortland-Battelle)
W71-11889

SAPROSPIRA TOVIFORMIS NOV. SPEC. (FLEXIBACTERALES) FROM A NEW ZEALAND SEASHORE,
Scripps Institution of Oceanography, La Jolla, Calif; and Texas Univ., Houston. Dept. of Biology.
Ralph A. Lewin, and Manley Mandel.
Canadian Journal of Microbiology, Vol 16, No 6, p 507-510, June 1970. 8 fig, 13 ref.

Descriptors: *Bacteria, *Cultures, Sands, Littoral.
Identifiers: New Zealand, Saprospira toviformis, Saprospira grandis, Flexibacterium, Agars.

A new species of flexibacterium, Saprospira toviformis, is described. It was isolated from marine littoral sand from New Zealand. It differs from S. grandis Gross by its more yellow color, more sluggish motility, and a number of minor physiological features. The content of guanine and cytosine, in the DNA of S. toviformis is 38 percent (as molar percent); the corresponding value for S. grandis is 48 percent. (Mortland-Battelle)
W71-11893

ELECTRON MICROSCOPY OF ADENOSINE TRIPHOSPHATASE IN ESCHERICHIA COLI CELLS,
Nauchno-Issledovatelskii Institut Vaktsin i Syvorotok, Moscow (USSR).
V. M. Kushnarev, T. A. Smirnova, and L. G. Dudenkova.
Canadian Journal of Microbiology, Vol 16, No 6, p 449-453, June 1970. 19 fig, 2 tab, 31 ref.

Descriptors: *E. coli, *Bioindicators, *Electron microscopy, Cytological studies, Cultures, Enzymes, Proteins, Phosphorus, Membranes, Bacteria.

Identifiers: *Adenosine triphosphatase, Cytochemical methods, Adenosine triphosphate, Adenosine diphosphate, Adenosine monophosphate, Staining.

The adeosine triphosphatase (ATPase) activity in Escherichia coli cells was investigated by a combination of electron microscopic and cytochemical methods. The activity is located in the cytoplasm and cytoplasmic membrane. After prolonged incubation in the substrate medium, the insoluble calcium phosphate was concentrated into several conglomerations and probably extruded from the cell. The possible mechanism of extrusion is also discussed. The location of ATPase in the membrane preparations was investigated by similar technique. The activity in the membranes is located in between the membrane subunits. The order of the subunits became well arranged after incubation with ATP. (Mortland-Battelle)
W71-11895

PRESERVATION OF VIABLE FLEXIBACTERIA AT LOW TEMPERATURES,
Scripps Institute of Oceanography, La Jolla, Calif.
Annika Sanfilippo, and Ralph A. Lewin.
Canadian Journal of Microbiology, Vol 16, No 6, p 441-444, June 1970. 1 tab, 8 ref.

Descriptors: *Preservation, *Bacteria, *Freezing, Cultures.
Identifiers: *Flexibacteria, Sample preservation, Cytophaga diffluens, Cytophaga diffluens aprica, Cytophaga diffluens carnea, Cytophaga latercula, Cytophaga lytica, Flexibacter aurantiacus, Flexibacter aurantiacus copepodarum, Flexibacter roseolus, Flexibacter elegans, Flexibacter flexilis, Flexibacter flexilis iolanthae, Flexibacter flexilis pelliculosus, Flexibacter giganteus, Flexibacter giganteus excathedrus, Flexibacter litoralis, Flexibacter ruber, Flexibacter sancti, Flexithrix dorothea, Herpetosiphon aurantiacus, Herpetosiphon cohaerans, Herpetosiphon geysericolus, Herpetosiphon nigricans, Herpetosiphon persicus, Microscilla aggregans, Microscilla aggregans catalatica, Microscilla arenaria, Microscilla furvescens, Microscilla marina, Microscilla sericea, Microscilla tractuosa, Saprospira albida, Saprospira flammula, Saprospira grandis, Saprospira thermalis, Saprospira toviformis.

Difficulties with maintaining the viability of marine and freshwater flexibacteria led to an investigation of ways to improve preservation of samples by freezing. Samples of 28 species (91 strains) of flexibacter were kept at ..3C, -22C, and -196C for various periods of time, thawed and incubated, and examined for growth. The effects of several additives such as glycerol and DMSO in the storage media were also investigated. Storage at -196C with no additives proved to be most satisfactory since all species survived except for 17 of 19 strains of Saprospira grandis and two other strains of Saprospira. Addition of glycerol and freezing at -196 conserved viable cultures of all the Saprospira except for one strain. Storage at -22C and ..3C was less satisfactory since a large number of strains died in relatively short periods of time (1 week). Details of the tests and results are included. (Little-Battelle)
W71-11896

ATOMIC ABSORPTION MICROSAMPLING WITH THE 'SAMPLING BOAT' TECHNIQUE,
Perkin-Elmer Corp., Norwalk, Conn.
Herbert L. Kahn, George E. Peterson, and Jane E. Schallis.
Atomic Absorption Newsletter, Vol 7, No 2, p 35-39, March-April 1968. 13 fig, 1 tab, 6 ref.

Descriptors: *Spectrophotometry, Urine, Organic compounds.
Identifiers: *Lead, *Arsenic, *Mercury, *Cadmium, Zinc, Selenium, Silver, Bismuth, Thallium, Chemical interferences.

Use of a sampling boat of tantalum for sample containment during analysis by atomic absorption has improved the efficiency of sample consumption with consequent improvement of detection limits for lead, zinc, arsenic, selenium, silver, mercury, bismuth, cadmium, and thallium. Low-level lead was determined in bismuth and urine; arsenic was determined in methanol which suggests that other organic solutions can be analyzed by this method. (Little-Battelle)
W71-11897

OCCURRENCE OF ATHIORHODACEAE IN WOODLAND, SWAMP, AND POND SOILS,
Minnesota Univ., Minneapolis. Dept. of Botany.
Douglas C. Pratt, and Eville Gorham.
Ecology, Vol 51, No 2, p 346-349, Early Spring 1970. 1 fig, 1 tab, 10 ref.

Descriptors: *Soils, *Ponds, *Swamps, *Photosynthetic bacteria, Bacteria, Sediments, Peat, Sampling, Humus, Grasslands, Minnesota, Spectrophotometry, Analytical techniques.
Identifiers: *Athiorhodaceae, Cedar Bog Lake (Minnesota), Thiorhodaceae, Rhodopseudomonas, Rhodospirillum.

To study the ecology of nonsulfur purple photosynthetic bacteria, samples of soil were collected from fields, mixed woodlands, cedar and tamarack swamps in the vicinity of Cedar Bog Lake, and from the lake itself which is actually a small pond about 1 meter deep. The samples were cultured and examined for the presence of photosynthetic bacteria using a spectrophotometer and a light microscope. The examinations confirmed the presence of Rhodopseudomonas and Rhodospirillum and showed that Athiorhodaceae were usually present in the pond muds and in the wet swamp hollows, with occurrences decreasing in drier areas. These results demonstrate that Athiorhodaceae is strongly dependent upon the degree of soil waterlogging. (Little-Battelle)
W71-11898

IDENTIFICATION OF CRUDE OILS BY THEIR GAMMA SPECTRA FOLLOWING NEUTRON IRRADIATION,
Wyoming Univ., Laramie. Dept. of Physics.
Hudson B. Eldridge, and John P. Flaherty.
Industrial and Engineering Chemistry, Product R and D, Vol 9, No 3, p 422-423, 1970. 1 fig, 6 ref.

Descriptors: *Oil, *Spectrometers, *Heavy metals, Analytical techniques, Gamma rays, Trace elements, Neutron activation analysis.
Identifiers: *Santa Barbara Channel (California), *Oil characterization, Crude oil.

Since trace metal contents of crude oils vary from different oils, and since these metals also have large neutron activation cross sections, an experiment was conducted to determine the feasibility of employing neutron irradiation and gamma-ray spectrometry to 'fingerprint' crude oils. Three samples of crude oil were irradiated and analyzed. One sample was oil that had been spilled in the Santa Barbara Channel; the other two were from possible source zones. The resulting gamma spectra of the samples showed strong simularities between the spilled oil and one of the known samples. The identification of the spilled oil was corroborated by chemical analyses conducted in other laboratories. The main advantage of the gamma spectra method is that it requires considerably less time and effort than chemical analysis. (Little-Battelle)
W71-11900

EFFICIENCIES OF VARIOUS GRABS AND CORERS IN SAMPLING FRESHWATER BENTHOS,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 07B.
W71-11903

METHOD FOR SEPARATING POLYCHLORINATED BIPHENYLS FROM DDT AND ITS ANALOGS,
Food and Drug Administration, Washington, D.C. Div. of Pesticide Chemistry and Toxicology.
Judith A. Armour, and Jerry A. Burke.
Journal of the Association of Official Analytical Chemists, Vol 53, No 4, p 761-768, July 1970. 3 fig, 2 tab, 14 ref.

Descriptors: *DDT, *Gas chromatography, *Pollutant identification, *Separation techniques, Heptachlor, Dieldrin, Endrin, Aldrin, Trout, Salmon, Lake Michigan, Pesticide residues.
Identifiers: *Polychlorinated biphenyls, Aroclors, Lindane, DDE, TDE, Metabolites.

A gas chromatography method was developed to separate polychlorinated biphenyls (PCB) from DDT and its analogs so that residues of pesticides and PCB could be determined without interference from the other. Separation is accomplished by column chromatography on silicic acid-Celite, PCBs are eluted from the column with petroleum ether prior to elution of pesticides with a mixture of acetonitrile, hexane, and methylene chloride. Determination of PCBs and pesticides can be made on the separate column eluates without cross interference. The method is applicable to samples prepared by multipesticide residue methodology and should be applicable to sample extracts prepared for gas chromatography by usual procedures. Recoveries of Aroclors 1254 and 1260 and of several chlorinated pesticides through the separation method ranged from 76 to 100 percent and 80 to 107 percent, respectively. In this study, the technique was applied to extracts of brown trout and Lake Michigan coho salmon. The coho salmon example provides additional evidence of the presence of PCB in some parts of the aquatic environment in this country. (Mortland-Battelle)
W71-11905

THIN LAYER CHROMATOGRAPHIC DETECTION OF CARBAMATE AND PHENYLUREA PESTICIDE RESIDUES IN NATURAL WATERS,
National Research Centre, Cairo (Egypt). Water Pollution Dept.
M. A. El-Dib.
Journal of the Association of Official Analytical Chemists, Vol 53, No 4, p 756-760, July 1970. 3 tab, 24 ref.

Descriptors: *Carbamate pesticides, *Chromatography, *Pollutant identification, Organophosphorus pesticides, Urea pesticides, Spectroscopy, DDT, Endrin, Dieldrin, 2 4-D, Pesticide residues.
Identifiers: *Thin layer chromatography, Carcinogens, Phenylurea pesticides, Ultraviolet spectroscopy, Lindane, Kelthane, Chemical interferences, Carbaryl, Baygon, Pyrolan, IPC, Linuron, Methyl parathion, Azinphosmethyl.

A simple and selective thin-layer chromatographic (TLC) technique for the detection, separation, and identification of some carbamates and phenylurea pesticide residues is described. Six solvent systems were found suitable. These were (1) benzene, (2) benzene-acetone (95 .. 5), (3) benzene-acetone (85 .. 15), (4) cyclohexane-ethanol (85 .. 15), (5) hexane-acetone-toluene (60 .. 20 .. 20), and (6) hexane-acetone (70 .. 30). The chromagenic reagent used for carbamates and phenylureas was 0.5 percent p-dimethylaminobenzaldehyde in a methanol. For phenylcarbamates and related compounds, 5 percent sodium nitrite in 0.2N HCL and 5 percent 1-naphthol in methanol were used. These were quite sensitive for detection of the tested pesticides; generally 2-5 micrograms pesticide could be detected. Chlorinated hydrocarbon and organophosphorus pesticide residues did not interfere. (Mortland-Battelle)
W71-11906

ANALYSIS OF p,p'-DDT AND p,p'-DDE PESTICIDE RESIDUES BY NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY,
Food and Drug Administration, Perrine, Wis. Div. of Pesticide Chemistry and Toxicology.
Francis J. Biros.
Journal of the Association of Official Analytical Chemists, Vol 53, No 4, p 733-736, July 1970. 2 fig, 1 tab, 11 ref.

Descriptors: *DDT, *Spectroscopy, *Pesticide residues, *Pollutant identification, Animal pathology, Human pathology, Analytical techniques.
Identifiers: DDE, Nuclear magnetic resonance spectroscopy, Adipose tissue, Liver tissue, Metabolites.

Nuclear magnetic resonance (NMR) spectroscopy has been utilized for semiquantitative analysis and confirmation of mixtures of p,p'-DDT and p,p'-DDE. Several known mixtures have been analyzed as well as pesticide residues isolated from human adipose tissue of an occupationally exposed individual and animal liver tissue from rats dosed with p,p'-DDT. The relative error found for the mole fractions of p,p'-DDT and p,p'-DDE in standard mixtures of these materials ranged from 0.5 to 4.1 percent, depending on the relative concentrations of pesticides present. Gas chromatographic analyses performed on the tissue extracts by electron capture and electrical conductivity detection agreed well with the results obtained by nuclear magnetic resonance. Because of the small amounts of materials isolated, the absolute quantities of pesticides present in the tissue were not determined. (An actual determination of the pesticide level may, however, be possible by dissolving an internal standard of known concentration in the final analytical solution.) Thus, the NMR method would be most useful for analysis of residues from tissues containing relatively high levels of materials as may be found in poisoning cases, high exposure cases, and metabolic studies in animals. (Mortland-Battelle)
W71-11907

POTENTIOMETRIC STUDIES WITH A LIQUID ION-EXCHANGE LEAD-SELECTIVE ELECTRODE,
Kentucky Univ., Lexington. Dept. of Chemistry.
Sudarshan Lal, and Gary D. Christian.
Analytica Chimica Acta, Vol 52, No 1, p 41-46, October 1970. 3 fig, 4 tab, 5 ref.

Descriptors: *Electrodes, *Ions, Analytical techniques, Alkali metals, Ammonium compounds, Hydrogen ion concentration, Volumetric analysis, Chemical precipitation.
Identifiers: *Lead, Thallium, Silver, Chemical interferences.

The performance of the Orion liquid ion-exchange lead-selective electrode has been determined in terms of the working concentration range of lead ions, its selectivity to other ions, its response time, the effective pH range in which it can be used, and its use in potentiometric titrations. The electrode exhibits relatively high response to monovalent cations and can be used in the potentiometric titration of alkali metals , thallium (I), silver (I), and ammonium ions with sodium tetraphenylboron, as well as for titrations of lead (II) with various solutions. The electrode functioned adequately at concentrations of 2 x 10 to the minus 5th power to 10 to the minus 2nd power M but optimal results were obtained at concentrations of 10 to the minus 4th power M or greater. (McCann-Battelle)
W71-11908

LAKE VOLTA--A PROGRESS REPORT,
Makerere Univ. Coll., Kampala (Uganda). Dept. of Zoology.
Tomislav Petr.
New Scientist, Vol 49, No 736, p 178-180, January 28, 1971. 2 fig.

Descriptors: *Reservoirs, *Reservoir fisheries, *Food webs, Dams, Lakes, Eutrophication, Nutrients, Phytoplankton, Oxygen requirements, Oxygenation, Cyanophyta, Diatoms, Fish, Perch, Food chains, Mayflies, Aquatic productivity.
Identifiers: Volta Lake (Ghana), Deoxygenation, Microcystis, Synedra, Mormyridae, Tilapia galilaea, Tilapia nilotica, Tilapra zillii, Sardines, Pellonula afzelius, Schilbe, Eutropius, Alestes, Lates niloticus, Hemichromis fasciatus, Povilla adusta, Pistia, Ceratophyllum.

When the Volta River in Ghana was dammed to create Lake Volta, there was practically no clearing of vegetation from the land to be flooded. It was feared that the tremendous amount of organic matter present in the lake would cause extensive and prolonged deoxygenation, preventing the establishment of fisheries. In actuality, many species of fish have flourished in the lake and they are feeding on mayfly larvae which have burrowed in the submerged wood. The question has now arisen as to what will happen to the high productivity of the lake when the trees have all decayed. (Mortland-Battelle)
W71-11909

VIRUS STUDIES ON THE WINDHOEK WASTEWATER RECLAMATION PLANT (SOUTHWEST AFRICA),
National Inst. for Water Research, Pretoria (South Africa).
Ethel M. Nupen.
Water Research, Vol 4, p 661-672, October 1970. 6 tab, 27 ref.

Descriptors: *Viruses, *Sewage, *Statistical methods, Water quality, Analytical techniques, Separation techniques, Cultures, Isolation, Water reuse, Waste water treatment, E. coli.
Identifiers: *Poliovirus, Republic of South Africa, Enterovirus, Reovirus.

Two relatively simple and inexpensive methods for the quantitative concentration of enteric viruses in large volumes of water and two methods for the subsequent detection of viruses are compared. One concentration method is based on the polymer 2-phase separation method and the other is the alginate ultra-filtration method. The plaquing technique and the roller-tube technique are compared for the subsequent detection of virus in the concentrated specimens. The TCID50 (50 percent tissue culture infective dose) method was found to be superior to the PFU (plaque forming unit) method for the detection and evaluation of viruses in sewage. Parallel statistical testing of the two-phase polymer separation method and of the alginate ultra-filtration method for the quantitative concentration of viruses in water samples showed comparable concentration and recovery of virus. These methods of concentration proved effective in the testing of the virus removal by the advanced waste-water treatment plant at Windhoek. Although enteroviruses and reovirus entered the sewage purification plant at levels as high as 20,000 TCID50 per litre, no virus could be recovered from the finally treated water. (McCann-Battelle)
W71-11913

HYPNODINIUM-LIKE ALGAL BLOOMS IN GEORGIA LAKES,
Georgia Water Quality Control Board, Atlanta; and Georgia State Univ., Atlanta. Dept. of Biology.
Edward T. Hall, Jr., Donald G. Ahearn, and Donald J. Reinhardt.
BioScience, Vol 21, No 3, p 115, February 1, 1971. 1 fig, 1 ref.

Descriptors: *Eutrophication, *Algae, *Sewage effluents, Georgia, Thermocline, Hydrogen ion concentration, Water temperature, Dissolved oxygen, Coliforms, Recreation, Odor.
Identifiers: *Lake Sidney Lanier (Georgia), Lake Jackson (Georgia), Lake Cardinal (Georgia), Lake Buckhorn (Georgia), Hypnodinium sphaericum.

An algal bloom is described similar to Hypnodinium sphaericum that has appeared each June since 1968 in Lake Sidney Lanier, Georgia. This bloom of varying intensity lasts 7-10 days. In 1969, the surface of the lake turned milky white. In 1970 the bloom occured shortly after the water stratified with a thermocline near 9 m. The surface water temperature was 28 C, the pH 9.1, and the dissolved oxygen 8.2 mg/liter. At the thermocline, the water temperature was about 17 C, the pH 8.3, and the dissolved oxygen 3.4 mg/liter. Four days prior to the recording of the bloom, the fecal coliform density increased from less than 4/100 ml to greater than 240/100 ml. Fifteen days later the coliform density was less than 3/100 ml. The alga has not been directly associated with any fish kills. A disagreeable odor accompanies the bloom and the thick surface flocs interfere with recreational activities. The significance and long-term effects of this alga are unknown. (McCann-Battelle)
W71-11914

A SEMIAUTOMATED PROCEDURE FOR DETERMINATION OF ADENOSINE TRIPHOSPHATE,
North Carolina School of Medicine, Chapel Hill. Dept. of Medicine.
L. Dufresne, and H. J. Gitelman.
Analytical Biochemistry, Vol 37, p 402-408, October 1970. 2 fig, 3 tab, 5 ref.

Descriptors: *Automation, *Bioassay, Spectrometry, Enzymes.
Identifiers: *Adenosine triphosphate, *Firefly luminescence, Liquid scintillation spectrometer, Autoanalyzer, Chemical interferences.

A semiautomatic modification of the firefly luminescence method for measuring adenosine triphosphate in erythrocytes has been developed. The technique employs conventional autoanalyzer equipment in conjunction with a liquid-scintillation spectrometer. The sensitivity of the system has permitted elimination of potential interferences by dilution of inorganic ions. The method is rapid, accurate, and precise, permitting 30 samples per hour to be estimated with relative convenience. The system should be applicable to a variety of biological samples. Additionally, a simplified manual technique for the preparation of erythrocyte samples for ATP assay has been devised. (Mortland-Battelle)
W71-11915

DETERMINATION OF ATP IN CHLORELLA WITH THE LUCIFERIN-LUCIFERASE ENZYME SYSTEM,
United States Department of Agriculture, Beltsville, Md. Crops Research Div.
J. B. St. John.
Analytical Biochemistry, Vol 37, p 409-416, October 1970. 1 fig, 4 tab, 18 ref.

Descriptors: *Chlorella, *Bioassays, Enzymes, Light intensity, Algae.
Identifiers: *Adenosine triphosphate, *Luciferin-luciferase enzyme system, Plant extracts, Chlorella sorokiniana.

A method for measuring ATP based on the firefly luciferin-luciferase reaction is described. The method involves a 30 second integration of the light produced following mixing of the sample and enzyme. The relationship between light measured and quantity of ATP present is linear over at least a thousandfold concentration range, with less than a 2 percent relative standard deviation. The method of light measurement includes the peak intensity of initial flash and a portion of the signal which follows. Therefore, the peak intensity of the initial flash alone is not necessarily the most reliable basis for measurement of ATP. The method uses a commercially available luciferin-luciferase preparation without further purification. The level of sensitivity is equal to that reported for purification. The level of sensitivity is equal to that reported for purified luciferin-luciferase preparations. The method of

constant addition for quantitative determination of ATP in plant extracts is described. The lack of specificity associated with the luciferin-luciferase reaction is controlled by this method. (Mortland-Battelle)
W71-11916

POLLUTION AND POLAROGRAPHY,
Chemtrix, Inc., Beaverton, Ore.
Joseph E. Nelson.
1970. 12 p. 6 fig, 11 ref.

Descriptors: *Polarographic analysis, *Pollutant identification, *Water analysis, Cathodes, Electrodes, Copper, Iron, Heavy metals, Trace elements, Chromium, Cobalt, Manganese, Calcium, Sodium, Potassium, Anions, Nitrates, Sulfates, Chlorides, DDT, Endrin, 2 4-D, Effluents, Surfactants.
Identifiers: Anodic stripping, Lead, Cadmium, Nickel, Zinc, Arsenic, Mercury, Bismuth, Antimony, Tin, Indium, Thorium, Vanadium, Iodine, Bromine, Cyanides, Malathion, Parathion, Acrylonitrile, Methacrylate, Styrene, Polymers, Monomers.

Rapid scan polarography can be used to quickly identify and measure many pollutants. This paper contains several specific polarographic techniques as well as a broad review of the application of polarography to pollution studies. The technique described provides a cathodic-anodic current-voltage curve from which both qualitative and quantitative data can be measured. The curve, stored on a memory-type oscilloscope, is produced by a rapid scan of a single mercury drop from a dropping mercury electrode (DME). This allows sensitivity to 10 to the 6th minus power molar for most ions with 10 to the 7th minus power and greater when catalytic or absorption waves can be used. The polarograph is also used for anodic stripping. Specific procedures are presented for determination of various metals, alkali metals, nitrates, arsenic, sulfates, chlorides, cyanides, pesticides, polymer effluents, and surfactants in water. (Mortland-Battelle)
W71-11917

THE DETERMINATION OF TRACE QUANTITIES OF MERCURY BY ATOMIC ABSORPTION SPECTROMETRY,
Georgetown Univ., Washington, D.C. Dept. of Chemistry.
L. P. Morgenthaler.
MPI Applications Notes, Vol 5, No 5, p 25-32, November 1970. 5 fig, 2 tab.

Descriptors: *Spectrometers, *Fungicides, Pollutant identification, Fish, Food chains, Toxicity, Water pollution effects.
Identifiers: *Mercury, *Atomic absorption spectrometry.

A rapid and simple atomic absorption spectrometry technique is described for the determination of trace quantities of mercury. In this method, the mercury is reduced in aqueous suution (Usually containing at least 1 M H2SO4) with tin (II) and sometimes with NH2OH. A stream of air bubbled through this solution carries the mercury vapor through a drying tube filled with Mg (ClO4)2, and then into a flow-through absorption cell. The cell is positioned between a low-pressure mercury vapor lamp and a monochromator that measures the 2357 angstrom radiation of the lamp. This method assumes that the maximum vapor pressure of mercury in the absorption tube is proportioned to the total quantity of mercury present in the original solution. This assumption is experimentally verifiable. (Mortland-Battelle)
W71-11918

METHODS FOR THE DETERMINATION OF TRACE ORGANIC MATERIALS IN WATER,
Department of the Interior, Washington, D.C. Office of Saline Water
Ihor Lysyi, Peter Newton, Arnett Counts, Frank C. Di Luzio, and W. S. Gillam.
Available from the National Technical Information Service as PB-178 525, $3.00 in paper copy, $0.95 in microfiche. Research and Development Progress Report No 152, March 1966. 45 p, 15 fig, 8 tab, 17 ref.

Descriptors: *Desalination, *Water quality control, *Gas chromatography, Separation techniques, Distillation, Water treatment, Alcohols, Organic compounds, Water analysis.
Identifiers: Amines, Freon, Hydrocarbons, Vacuum distillation.

Research was conducted to develop gas chromatographic methods for analyzing product waters for trace organics. Techniques based on gas chromatographic separation and ionization detection were developed for four classes of organic material used in desalination processes: hydrocarbons, Freons, amines, and alcohols. The developed techniques in all cases are capable of direct analysis of water samples and have experimentally demonstrated the capability of detection in the sub-ppm concentration range. A second phase of the program dealt with developing the methodology for the analysis of naturally occurring organics in water sources. An analytical approach based on separation and preconcentration by means of vacuum distillation of volatile and nonvolatile organic fractions coupled with removal of the water matrix appears to be feasible; however, fuller evaluation of this technique is indicated. (Mortland-Battelle)
W71-11920

RESULTS OF OVERFLIGHTS OF CHEVRON OIL SPILL IN GULF OF MEXICO
Coast Guard, Washington, D.C. Applied Technology Div.
Clarence E. Catoe.
Available from the National Technical Information Service as AD-714 681, $3.00 in paper copy, $0.95 in microfiche. Final Report, August 24, 1970. 19 p. 10 fig, 12 ref.

Descriptors: *Oil wastes, *Aerial photography, *Remote sensing, *Infrared radiation, *Ultraviolet radiation, Oil, Oily water, Pollutant identification, Louisiana.
Identifiers: Infrared photography, Ultraviolet photography, Infrared imagery, Oil spills.

The Chevron oil spill off the Louisiana coast in March 1970, was surveyed to investigate the potential of various remote sensing techniques for detecting and identifying oil slicks. Aerial photography (Color infrared, and ultraviolet) and infrared imagery were used during overflights of the spill. Color photography, because of the low contrast between oil and water, was effective only where the oil was quite thick. The color infrared photographs offered greater contrast between oil and water interface, with oil showing up as pink or red while water appeared blue. However, a certain amount of ambiguity appeared in these photographs in that sun glint and vegetation also gives a pink and red response. With UV sensitive flim, the fluorescence coming from the oil was easily detected. Infrared imagery in the 8 to 14 micrometer region offered very good definition of oil due to its emissivity differences. However, it should be realized that even though the imagery obtained was favorable and cross-correlatable, photographic techniques utilized in these overflights are generally limited to sunlight and fair weather conditions. The infrared imagery on the other hand was capable of weather limited, i.e., the slightest amount of fog or haze completely obscures the target. (Mortland-Battelle)
W71-11921

IODINE IN THE ENVIRONMENT,
National Institute of Arthritis and Metabolic Diseases, Bethesda, Md.
For primary bibliographic entry see Field 05B.
W71-11928

COMPARISON OF TWO PLATING MEDIA FOR DETECTION OF SALMONELLA FROM SWINE TISSUES,
Department of Agriculture, Ames, Iowa. Animal Health Div.
Rube Harrington, Jr., and Edwin M. Ellis.
Applied Microbiology, Vol 20, No 5, p 851, November 1970. 1 tab, 4 ref.

Descriptors: *Salmonella, *Culture, Separation techniques, Microbiology, Isolation.
Identifiers: *Agars, Xylose-lysine-Brilliant Green, Brilliant Green sulfadiazine.

Xylose-lysine-Brilliant Green-agar and Brilliant Green-sulfadiazine-agar were used to isolate salmonellae from swine tissue. There was no significant difference in the efficiency of the two media. Of 224 tissues examined with each, 53 isolations (23.7 percent) were made from XLBG, and 55 isolations (24.6 percent) from BGS. (Mortland-Battelle)
W71-11929

THE SPECTROFLUORIMETRIC DETERMINATION OF SULPHIDES,
Salford Univ. (England). Dept. of Chemistry.
L. S. Bark, and A. Rixon.
Analyst, Vol 95, p 786-790, September 1970. 1 fig, 10 ref.

Descriptors: *Sulfides, *Fluorometry, *Pollutant identification, Trace elements, Ions, Hydrogen ion concentration, Toxicity.
Identifiers: *Hydrogen sulfide, *Spectrofluorimetry, Chemical interference.

The spectrofluorimetric determination of trace amounts of sulphide with mercury (II) - 2,2'-pyridylbenzimidazole is described. The sulphide can be determined in solutions with concentrations in the range 300 pg to 300 ng ml (-1). Interferences can be avoided by the use of standard distillation procedures. The main advantages, apart from the extremely high sensitivity of the method, are the high stability of the reagent and of the reacted sulphide system. The over-all time of the method after liberation of the sulphide can be as little as 2 to 5 minutes, and the time lapse between the reaction and measurement of solution is not critical as up to 48 hours' delay has no significant effect. (Mortland-Battelle)
W71-11931

SYNERGISTIC FALSE-POSITIVE COLIFORM REACTION ON M-ENDO MF MEDIUM,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W71-11932

GROWTH RESPONSES OF ESCHERICHIA COLI TO THE SURFACTANT DODECYL BENZENE SULFONATE,
California State Coll., Los Angeles. Dept. of Microbiology and Public Health.
For primary bibliographic entry see Field 05B.
W71-11933

POLYCHLORINATED BIPHENYLS IN HUMAN ADIPOSE TISSUE,
Food and Drug Administration, Perrine, Fla. Div. of Pesticides.
Francis J. Biros, Annita C. Walker, and Angela Medbery.
Bulletin of Environmental Contamination and Toxicology, Vol 5, No 4, p 317-323, July/August 1970. 7 fig, 3 ref.

Descriptors: *Pesticide residues, *Gas chromatography, *Chlorinated hydrocarbon pesticides, Water pollution, Analytical techniques, Toxicity, Human pathology.
Identifiers: *Polychlorinated biphenyl.

A combined gas chromatograph-mass spectrometer system was used to analyze polychlorinated biphenyls (PCB) in human adipose tissue. Two samples were examined and shown to contain substantial quantities of PCB, ranging from pentachlorobiphenyl to decachlorobiphenyl and including at least 14 isomers and chlorine homologs. The origin of the PCB compounds was unknown, but the data described the gas chromatographic-mass spectrophotometric behavior of PCB and verified the applicability of this technique to PCB analysis in human tissue. (Mortland-Battelle)
W71-11935

WATER TEMPERATURE AS A SOURCE OF VARIATION IN SPECIFIC ACTIVITY OF BRAIN ACETYLCHOLINESTERASE OF BLUEGILLS,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
For primary bibliographic entry see Field 05C.
W71-11938

FORMATION OF 'PHOTODIELDRIN' BY MICROORGANISMS,
Wisconsin Univ, Madison. Dept. of Entomology.
For primary bibliographic entry see Field 05B.
W71-11940

JOINT O.E.C.D./T.N.O. CONFERENCE ON OCCURRENCE AND SIGNIFICANCE OF PESTICIDE RESIDUES IN THE ENVIRONMENT HELVOIRT, NETHERLANDS, 15TH-18TH SEPTEMBER 1969.
Organization for Economic Co-Operation and Development, Paris (France).

OECD Report, September 1970. 46 p.

Descriptors: *Pesticides, *Heavy metals, *Ecosystems, *Animal physiology, Animals, Foods, DDT, Bioassay, Sampling, Florida, Maryland.
Identifiers: Lucille F. Stickel, Philip A. Butla, F. Korte, William H. Stickel, John M. Anderson, J. H. Koeman, Cloes Ramel, Mercury, S. Jensen, Germany, Canada, Netherlands, Sweden, Polychlorinated biphenyls, Organomercury pesticides, Biological magnification.

This document records the proceedings of the second O.E.C.D. Technical Conference on the unintended occurrence of pesticides. The conference was convened to discuss and interpret the results of the second series of measurements in the voluntary cooperative study program on residues in wildlife. The general conclusions of the conference were as follows: (1) Data are lacking on production and use of pesticides. (2) Monitoring on its own does not allow an assessment of ecological effects since it does not permit the detection of minor changes and therefore presents an evaluation of the residues found in terms of risk to the ecosystem. (3) Toxicity studies, as they are made in member countries in relation to residues in human food, should not only concentrate on the dose-response relationship; wherever possible, data relating animal tissue concentrations (residues) to a fact should be involved. (4) Intensive research efforts during the past few years have led to the development of egg shell thickness as a first biological parameter of effect, which may be applied to species sampled in the field. (5) More information is needed on behavioral changes in relation to dose and concentration of pesticides, and in relation to residues in tissue and blood. (6) More work is necessary on the kinetics of pesticides in animals and in the environment. (McCann-Battelle)
W71-11941

PROCESS GAS CHROMATOGRAPHIC ANALYSIS OF LIQUIDS CONTAINING HIGH-BOILING RESIDUES OR DISSOLVED SOLIDS,
American Oil Co., Whiting, Calif; and Fullerton, Calif. Process Instruments Div. Beckman Instruments, Inc., Fullerton, Calif.
J. Smith, and R. Villalobos.
Analysis Instrumentation, Vol. 6, p 129-137, 1969. 11 fig.

Descriptors: *Gas chromatography, *Dissolved solids, Steam, Solvents, Oil wastes.
Identifiers: Hydrocarbons, Styrene.

A new gas chromatographic technique makes possible the analysis of liquids containing high-boiling residues and dissolved solids. A flushing solvent or scavenger such as steam is used once each analysis cycle to automatically remove the non-volatile material which would otherwise accumulate in the gas chromatograph and ruin or plug the columns. The flushing of the sample vaporization area may be done at a constant rate for a selected period of time, or with a fixed volume of solvent. Carrier gas purges the flushing medium from the instrument prior to the next analysis. The technique has been successfully applied to the analysis of a hydrocarbon stream with a boiling range of 300-1100 F, and to the analysis of crude styrene containing high-boiling residues and dissolved solids. (McCann-Battelle)
W71-11944

APPLICATION OF A HIGH SENSITIVITY TOTAL ORGANIC CARBON ANALYZER,
Beckman Instruments, Inc., Fullerton, Calif. Process Instruments Div.
Robert H. Jones, and Allen F. Dageforde.
Analysis Instrumentation, Vol. 6, p 43-51, 1969. 10 fig, 4 ref.

Descriptors: *Analytical techniques, *Carbon, *Pollutant identification, Sewage effluents, Industrial wastes, Organic compounds, Infrared radiation, Instrumentation, Carbon dioxide, Carbonates.
Identifiers: *Total organic carbon.

The total organic carbon analyzer, developed at Dow Chemical, operates by first measuring total carbon and then determining inorganic carbon in a second operation. The organic carbon content is then arrived at by simple subtraction. The instrument is operated manually. In normal operation, total carbon is determined by measurement of CO2 resulting from combustion and decomposition of carbon compounds in a catalyst-packed (cobalt oxide) column at high temperature (950 C). Measurement is by infrared instrumentation. Inorganic carbon is determined by CO2 measurement where the CO2 results from the breakdown of carbonates or the release of dissolved CO2. This mode of operation limits the sensitivity of the instrument and requires the use of relatively small samples. On low level organic carbon samples the instrument can be operated at high gain with large samples. This method may improve the accuracy of analysis of organic carbon in surface waters and in other applications important to water pollution control. (Mortland-Battelle)
W71-11945

ANNUAL PROGRESS REPORT JULY 1, 1968 - JUNE 30, 1969, FRESHWATER VERTEBRATE AND INVERTEBRATE ECOLOGY OF AMCHITKA ISLAND,
Utah State Univ., Logan.
For primary bibliographic entry see Field 05C.
W71-11946

THE USE OF PHLOXINE B AND ROSE BENGAL STAINS TO FACILITATE SORTING BENTHIC SAMPLES,
Federal Water Pollution Control Administration, Cincinnati, Ohio.
William T. Mason, Jr., and Paul P. Yevich.
Transactions of the American Microscopical Society, Vol. 86, No. 2, p 221-223, 1967. 1 tab, 5 ref.

Descriptors: Benthic fauna, Analytical techniques.
Identifiers: *Phloxene B, *Rose bengal, *Xanthene stains, Engineering Sciences, Inc., Klamath River, Lost River, Oregon, Sorting.

One of the most tedious and time-consuming tasks in gathering benthic data is separating the organisms from the debris. Sorting samples by hand with the aid of a lowe power scanning lens is still the most widely used method of separation. Ekman dredge samples collected from different substrate types in the Klamath River and Lost River, Oregon were used in a time test to determine whether staining reduces sorting time. Benthic samples stained with phloxine B at a concentration of 100 mg/l in ethanol or formalin preservatives were sorted in approximately half the time required for unstained samples. The time saved in sorting benthic samples will of course depend on the amount of detritus, number of organisms, and the skill of the sorter. The stain concentration must be adjusted to suit the particular substrate type, and increased if the samples are composed primarily of organic detritus. Variations in coloration are often important taxonomic characteristics in keying aquatic macroinvertebrates. If necessary, most of the stain can be removed from the organisms by placing them in 95 percent ethyl alcohol. As yet the stains have not interfered with specific determinations based on color distinctions. (McCann-Battelle)
W71-11947

PESTICIDE RESIDUES IN CHANNEL CATFISH FROM NEBRASKA,
Nebraska Game and Parks Commission, Lincoln. Research Div.
N. P. Stucky.
Pesticides Monitoring Journal, Vol. 4, No. 2, p 62-66, September 1970. 2 fig, 3 tab, 13 ref.

Descriptors: *DDT, *Channel catfish, *Nebraska, *Dieldrin, Sampling, Gas chromatography, Separation techniques, Missouri River.
Identifiers: Metabolites, Electron capture gas chromatography, Niobrara River (Nebraska), White River (Nebraska), Platte River (Nebraska), Salt Creek (Nebraska), Loup River (Nebraska), Elkhorn River (Nebraska), Logan Creek (Nebraska), Little Nemaha River (Nebraska), Big Nemaha River (Nebraska), Big Blue River (Nebraska), Little Blue River (Nebraska), Republican River (Nebraska).

Channel catfish (Ictalurus punctatus) were collected in all of the major watersheds in Nebraska during the summer of 1964. Individual fat samples and composite blood samples obtained from these fish were analyzed to determine the concentrations of residues of DDT and its metabolites (o,p'-DDT, p,p'-DDT, p,p'-DDD, and DDE) and dieldrin. A total of 178 fish, collected from 18 sites, were analyzed. As expected, the fat samples contained higher concentrations of the pesticides than did the blood samples. DDT residues were found in all fat samples, and average levels from 10 fish sampled at each site ranged from a low of 2.2 p.p.m. in the sandhills region to a high of 92.2 p.p.m. in Salt Creek below Lincoln, Nebraska. Average dieldrin residues in fat samples ranged from 0.1 to 6.7 p,p,m. All values are expressed as p.p.m. of residue detected in each sample of fat. The composite blood samples were found to contain DDT residue concentrations ranging from a low of less than 0.01 p.p.m. to a high of 0.16 p.p.m. Dieldrin residue concentrations ranged from a low of less than 0.01 p.p.m. to a high of 0.07 p.p.m. (McCann-Battelle)
W71-11950

A SCHEME OF QUALITATIVE ANALYSIS FOR TWENTY COMMON CATIONS,
Allahabad Univ. (India). Dept. of Chemistry.
Animesh K. Ghose, and Arun K. Dey.
Analyst, Vol. 95, p 698-701, July 1970. 6 ref.

Descriptors: *Separation techniques, *Heavy metals, *Colorimetry, *Cations, Ions, Pollutant identification, Solvent extractions, Copper, Iron, Cobalt, Calcium, Aluminum, Magnesium, Barium, Silver, Chromium.
Identifiers: *Ring-oven colorimetry, Mercury, Tin, Bismuth, Arsenic, Antimony, Zinc, Lead, Manganese, Nickel, Cadmium, Strontium.

A qualitative scheme has been devised for the separation and subsequent identification of twenty common cations in 1 drop of unknown mixture by the ring-oven technique. The solution containing the unknown mixture is spotted on to a circular filter-paper, and it is then separated into different small groups containing not more than four cations by washing the spot with appropriate organic solvents. The separated cations are collected in the form of thin rings, 22 mm in diameter, on separate filter-papers. The rings of the deposited cations are then cut into sectors depending on the number of the metal ions present in a particular ring and tested for individual ions with the specific chromogenic reagents. The advantages of this scheme over previous ones are that it is less time consuming; no prior separations are necessary; all the separations are done on the ring oven, the number of members separated in an individual group is small and thus interferences of cations in a single ring are minimized; and only one disc is used throughout the separation. (Mortland-Battelle)
W71-11951

ELECTROCHEMICAL METER FOR ACTIVITY MEASUREMENTS IN NATURAL ENVIRONMENTS,
California Univ., Berkeley. Inst. of Marine Resources and Engineering Geoscience.
For primary bibliographic entry see Field 02K.
W71-11953

IDENTIFICATION AND SURFACTANT DEGRADING ABILITY OF BACTERIA--'STANDARD' SHAKE FASK INOCULUM,
Army Natick Lab., Natick, Mass. Pioneering Research Lab.
Morris R. Rogers, and Arthur M. Kaplan.
Journal Water Pollution Control Federation (Res. Supple.), Vol. 42, No. 8, Part 2, p R263-R269, August 1970. 1 tab, 20 ref.

Descriptors: *Waste water treatment, *Detergents, *Activated sludge, *Bioindicators, Surfactants, Cultures, Pseudomonas, E. coli, Biodegradation, Isolation.
Identifiers: *Shake culture method, Agars, Pseudomonas pavonacea, Pseudomonas dacunhae, Pseudomonas membranoformis, Pseudomonas arvilla, Pseudomonas cruciviae, Pseudomonas striata, Achromobacter cycloclastes, Paracolobactrum intermedium, Flavobacterium, Moraxella, Alcaligenes.

A study was conducted to isolate and identify the bacteria present in a shake culture inoculum originating from activated sludge and maintained on synthetic culture media for an extended period, and to show the comparative ability of the pure isolates to biodegrade LAS. The dominant organism isolated from the shake culture was Pseudomonas. Based on the results, it appears that unrelated bacteria can utilize LAS as pure cultures and can serve as a satisfactory inoculum in bringing about surfactant biodegradation by the shake culture method. It is emphasized that properly identified test organisms are very important in any microbiological test system. (Mortland-Battelle)
W71-11954

GAS-WATER CHROMATOGRAPHY AIDS WATER POLLUTION ANALYSIS.
National Bureau of Standards, Washington, D.C.

U. S. National Bureau of Standards - Technical News Bulletin, Vol. 54, No. 7, p 143, July 1970.

Descriptors: *Gas chromatography, *Aqueous solutions, Separation techniques, Pollutant identification, Aromatic compounds, Ions.
Identifiers: *Hydrocarbons, Unsaturates, Olefin, Alkanes, Ethylene, Propylene, Isobutene, Toluene, Benzene.

A brief description of work done at NBS on analysis of hydrocarbons present in water is given. Aqueous solutions of complexing metal ions are used as the stationary phase in GLC columns. Details are presented in the article listed as (AMIC-218). (Little-Battelle)
W71-11956

GAS CHROMATOGRAPHIC DETERMINATION OF PARTITION COEFFICIENTS OF SOME UNSATURATED HYDROCARBONS AND THEIR DEUTERATED ISOMERS IN AQUEOUS SILVER NITRATE SOLUTIONS,
National Bureau of Standards, Washington, D.C.
For primary bibliographic entry see Field 02K.
W71-11957

TENTATIVE METHOD FOR MERCURY.
Federal Water Quality Administration, Cincinnati, Ohio. Analytical Quality Control Lab.

September 1970, 10 p. 2 fig, 4 ref.

Descriptors: *Spectrophotometry, *Chemical analysis, *Laboratory equipment, *Heavy metals, *Mud, *Sediments, *Fish, *Waste water (Pollution), *Saline water, *Surface waters, *Effluents.
Identifiers: *Interference, *FWQA provisional methods, *Mercury, *Mercury compounds, *Atomic absorption spectrophotometry, Sample preservation.

A provisional method has been established by the Federal Water Quality Administration for the analysis of mercury and mercury compounds in surface waters, saline waters, waste waters, and effluents. Mud, sediment, and fish tissue may also be analyzed after proper pretreatment. The analysis is performed by applying atomic absorption techniques to samples that have been treated with potassium permanganate followed by a treatment of potassium persulfate to insure that organo-mercury compounds will be oxidized to the mercuric ion before measurement. The detection limit of this method is 0.5 microgram Hg/l. All pertinent details regarding equipment, sample handling and preservation, interferences, and calibration are included. (Little-Battelle)
W71-11958

A COMPARISON OF BENTHIC MACROINVERTEBRATES COLLECTED BY DREDGE AND BASKET SAMPLER,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Div. of Pollution Surveillance.
J. B. Anderson, and William T. Mason, Jr.
Journal Water Pollution Control Federation, Vol. 40, No. 2, Part 1, p 252-259, February 1968. 2 fig, 4 tab, 6 ref.

Descriptors: *Sampling, *Ohio River, *Bioindicators, *Midges, *Caddisflies, *Mayflies, *Stoneflies, *Oligochaetes, *Dredging, *Crustaceans, *Gastropods, *Analytical techniques, Flatworms, Mollusks, Coelenterates, Leeches, Benthos, Macroinvertebrates, Surveillance, Damselflies.
Identifiers: *Wabash River, *Basket sampler, *Artificial substrates, *Coelenterates, *Bryozoa, *Odonata, Trichoptera, Coleoptera, Hirudinea, Turbellaria, Anisoptera, Zygoptera, Decapoda, Amphipoda, FWQA methods, Coelenterata, Petersen dredge, Chironomidae, Ohio River.

In order to compare the value of the basket sampler to the Petersen dredge, benthic samples were collected by both methods from the Ohio and Wabash Rivers. The dredge samples were taken during 1962 and 1963, and the basket samples were taken four times from June to November 1965. In 4 basket samples, taken at Cincinnati, a total of 13 species, numbering 445 organisms were present, including 114 chironomidae represented by 6 species. There were 320 larvae of the caddisfly. Of 4 basket samples collected at Louisville, a total of 28 species numbering 574 organisms was obtained. Chironomidae numbered 171 and were represented by 14 species. There were 254 trichoptera, 21 ephemeroptera, and 76 mollusca. Oligochaetes were collected only with the dredge. The number of midge species collected by dredge was much less than the number with the basket sampler. Although mollusks also were obtained by dredge, practically no trichoptera, ephemeroptera, or odonata were. The samples collected from the Wabash River contained a total of 1,605 organisms and 38 species. Over 700 of the organisms were midges, nearly 500 caddisflies, approximately 150 mayflies, and 100 odonates. With the dredge sampler eight species, excluding oligochaetes, were collected. Since the basket samplers and the Petersen dredge collect different species of macroinvertebrates, the Water Pollution Surveillance System utilizes both methods. (Little-Battelle)
W71-11960

THE THIN-LAYER CHROMATOGRAPHIC PROPERTIES OF TRACE METALS: I. SEPARATION OF SOME METALS WITH SPECIAL REFERENCE TO LEAD,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Chemistry.
V. Miketukova, and R. W. Frei.
Journal of Chromatography, Vol 47, p 427-434, March 1970. 3 fig, 2 tab, 14 ref.

Descriptors: *Chromatography, *Trace elements, *Cobalt, *Copper, *Manganese, Iron, Solvents, Ions.
Identifiers: *Thin-layer chromatography, *Bismuth, *Lead, *Nickel, *Uranium, *Vanadium, Zinc, Cellulose sheets, Silica gel sheets, Acetone, Isopropanol, Acetic acid, Hydrochloric acid, Nitric acid, Methanol, Reagents, Rf, Chromagram sheets.

This first part of the investigation considered thin-layer chromatographic behavior of metals with various solvent systems on cellulose, silica gel, and Eastman Chromagram sheets. The cations investigated were: Bi, Cd, Mn, Pb, U, Ni, Co, Zn, and Fe. Because of the inherent difficulties encountered with lead, special emphasis was given to this ion. Interferences resulting from iron and zinc impurities were eliminated by prewashing the sheets with the same solvent system as was used later for separation. The solvent systems employed included mixtures of acetone - isopropanol - acetic acid - HCl - water in various combinations and proportions. The solvent system methanol - 25% HNO3 - water (8:1:1) gave satisfactory results for successful separation of lead from other cations. The results of the tests were compared with paper chromatographic separation methods. New spray reagents, 4 - (2 - thiazolylazo) resorcinol, 1 - (2 - thiazolylazo)- 2 - naphthol, 4 - (2 - pyridylazo) resorci nol, and 1 - (2 - pyridylazo) - 2 - naphthol, were successfully introduced for the detection of metals as distinctly coloured complexes. Visual detection limits ranged from 0.1 to 0.01 microgram per spot. (See also W71-11964) (Little-Battelle)
W71-11963

THE THIN-LAYER CHROMATOGRAPHIC PROPERTIES OF TRACE METALS: II. SEPARATION OF SOME CATIONS ON COMMERCIALLY PRECOATED SHEETS,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Chemistry.
V. Miketukova, and R. W. Frei.
Journal of Chromatography, Vol 47, p 435-441, March 1970. 2 fig, 4 tab, 9 ref.

Descriptors: *Chromatography, *Trace elements, *Cobalt, *Copper, *Manganese, *Iron, Solvents, Ions.
Identifiers: *Thin-layer chromatography, *Bismuth, *Lead, *Nickel, *Uranium, *Cadmium, *Vanadium, *Zinc, Cellulose sheets, Silica gel sheets, Acetone, Acetic acid, Hydrochloric acid, Nitric acid, Methyl ethyl ketone, Isopropanol, Methanol, Rf.

The present investigation considered the behavior of the following ions: Bi, Cd, Co, Cu, Fe, Mn, Ni, Pb, U, V, and Zn. The effect of seven solvent systems on the separation of the metals on com-

mercially precoated cellulose and silica gel sheets was investigated. In general, it was observed that on silica gel more efficient separations could be obtained for all the metals investigated. In order to combine the advantages of two solvent systems, mixtures of acetone, isopropanol, and hydrochloric acid were investigated in various proportions. From the data gathered in the study, it appears that for the separation of trace metals with the solvent systems investigated, silica gel is a far more effective absorbent than cellulose; however, it takes about three times longer to develop a chromatogram on silica gel than on cellulose sheets. It was also found necessary to prewash the sheets to eliminate impurities, especially zinc and iron (III). For most metals, visual detection limits range from 0.1 to 0.01 microgram per spot. The r reproducibility of the chromatographic pattern, the reagent background, and the stability of the metal chelates adsorbed on the sheets are such that they make this method suitable for in situ diffuse reflectance spectroscopic evaluation of the chromatograms. The data are included in tables and figures. (See also W71-11963) (Little-Battelle)
W71-11964

METHOD FOR THE EXAMINATION OF PHARMACEUTICAL LIQUID PRODUCTS FOR SALMONELLA,
Abbott Labs. Ltd., Queenborough (England).
D. A. Wilson.
Laboratory Practice, Vol 19, No 11, p 1135, November 1970. 1 tab, 10 ref.

Descriptors: *Salmonella, *Cultures, *Membrane processes, Filtration.
Identifiers: *Membrane filtration, Agars, Salmonella paratyphi B.

A membrane filtration process for isolating Salmonella from liquid products, e.g. syrups, is described. From 10 to 50 ml of sample is added to 1,000 ml of sterile 0.9 percent saline and mixed until uniformly distributed. The flask is placed on a suitable metal stand and connected to a sterile glass or plastic filter holder containing a 0.4 micron porosity, 47 mm diameter membrane filter. The filter is connected to a sterile Buchner flask and a vacuum is drawn. After all the sample has passed through, the filter is washed with sterile saline solution to remove any traces of inhibitory substances. The filter is divided into two portions with sterile scissors. One half is added to selenite broth and the other half is added to tetrathionate broth. Incubation is carried out at 35C for 24 hours. The fluid media are streaked on to plates of Salmonella-Shigella agar, brilliant green agar and bismuth sulphite agar. These are incubated at 35C for 24 hours and examined for typical colonies. At least three suspect colonies are used for the con-confirmatory tests. Each colony is inoculated into a tube of lysine decarboxylase medium; on to a urea agar slope and on to a heart infusion agar slope. Slide agglutination tests are carried out to demonstrate that the organism is a Salmonella. (Mortland-Battelle)
W71-11965

IDENTIFICATION OF A RECURRING BACTERIAL CONTAMINANT IN A SPACECRAFT WATER SYSTEM,
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
A. J. Bryce.
Available from the National Technical Information Service as N70-34398, $3.00 in paper copy, $0.95 in microfiche. Ames Research Center Contract report NASA-CR-73431, August 11, 1970. 6 p, 2 tab.

Descriptors: *Bacteria, *Potable water, *Pollutant identification, Nutrient requirements, Cultures, Water pollution treatment.
Identifiers: Pseudomonas boreopolis.

Prior to launch of a biosatellite carrying a monkey into space, stringent chemical and biological constraints were applied to the drinking water supply system. However, random bacterial contamination repeatedly occurred. Laboratory testing showed the contaminating organism to be capable of growth on a nutrient supply indetectable by standard analytical procedures. Inocula of the organisms were incubated in flasks containing high-purity deionizedose previously estimated for the period 1949-1963. Data on water quality were also obtained for a number of major pollution sources. Comparisons show that previous mathematical models for the Delaware Estuary can still be used to verify dissolved oxygen levels. Current levels of dissolved oxygen fail to meet the standards established by the Commission. It is concluded that in the future, regulation of carbonaceous raw waste of industry and municipalities will be sufficient to meet these standards. This report provides background for further analysis of economically feasible alternative programs on the Delaware River. (McCann-Battelle)
W71-11967

DELAWARE ESTUARY AND BAY WATER QUALITY SAMPLING AND MATHEMATICAL MODELING PROJECT.
Delaware River Basin Commission, Trenton, N.J.

Available from the National Technical Information Service as PB-193 799, $3.00 in paper copy, $0.95 in microfiche. Final Progress Report, May 1970. 105 p, 27 fig, 10 tab, 10 ref.

Descriptors: Water quality, Sampling, Water temperature, Dissolved oxygen, Hardness (Water), Turbidity, Delaware River, Estuaries, New Jersey, Pennsylvania, Delaware, Mathematical Models, Flow rates, Electrical conductance, Odor, Hydrogen ion concentration, Acidity, Alkalinity, Phosphates, Chlorides, Ammonia, Nitrites, Nitrates, Biochemical oxygen demand, Chlorophyll, Coliforms, Streptococcus, Chromium, Copper, Iron, Suspended load, Phenols, Oxygen-reduction potential.
Identifiers: FWQA Reports, Delaware Bay, Nickel, Zinc, Syndets.

This is a report on a demonstration grant from the Federal Water Pollution Control Administration. The principal contents are comparisons of water quality parameters for the Delaware Estuary with those previously estimated for the period 1949-1963. Data on water quality were also obtained for a number of major pollution sources. Comparisons show that previous mathematical models for the Delaware Estuary can still be used to verify dissolved oxygen levels. Current levels of dissolved oxygen fail to meet the standards established by the Commission. It is concluded that in the future, regulation of carbonaceous raw waste of industry and municipalities will be sufficient to meet these standards. This report provides background for further analysis of economically feasible alternative programs on the Delaware River. (McCann-Battelle)
W71-11968

OCCURRENCE OF NEMATODES IN BENTHIC DEPOSITS,
Illinois Univ., Urban. Dept. of Civil Engineering.
K. Y. Baliga, J. H. Austin, and R. S. Engelbrecht.
Water Research, Vol 3, p 979-993, 1969. 4 fig, 4 tab, 22 ref.

Descriptors: *Nematodes, *Benthos, *Separation techniques, *Sewage effluents, Oxidation-reduction potential, Sampling, Distribution patterns, Illinois, Waste treatment, Flow rates, Water temperature, Hydrogen-ion concentration, Dissolved oxygen, Bottom sediments, Water quality characteristics, Staining, Sampling techniques, Sample preservation, Methodology, Counting techniques.
Identifiers: Centrifugal flotation technique, Illinois stream, Nematoda, Scoop sediment sampler.

A method has been developed and found satisfactory for sampling and separation of nematodes in benthic deposits of shallow streams with sandy bond permanent pollution and awarded plaintiffs judgment. On appeal, defendant contended that there was insufficient evidence to support a finding of permanent pollution, the doctrine of appropriation applied only to public lands, plaintiffs had acquired no water rights because they were not mentioned in prior deeds. The Supreme Court of Washington affirmed and held that there was substantial evidence to prove permanent damages since defendant had no intention of correcting the situation. The court ruled a water right was an interest in real property appurtenant to the land and passes to the grantee when the land is conveyed. The court ruled plaintiffs were entitled to permanent damages plus the reasonable cost of securing a substitute water supply prior to the time of trial. (Horwitz-Florida)
W71-11974

ANALYSIS OF MULTICOMPONENT ORGANIC MIXTURES IN AQUEOUS MEDIA BY PYROLYSIS,
Rocketdyne, Canoga Park, Calif. Research Div.
Ihor Lysyj, Kurt H. Nelson, and Steve R. Webb.
Water Research, Vol 4, p 157-163, 1970. 1 fig, 2 tab, 4 ref.

Descriptors: *Gas chromatography, *Oil wastes, *Least squares method, *Separation techniques, *Pollutant identification, Industrial wastes, Municipal waters, Aqueous solutions, Organic compounds, Oil.
Identifiers: *Pyrolysis, Glycerol, DL-valine, Hexanoic acid, Petroleum characterization.

For general characterization of industrial and municipal wastes in waterways, a direct pyrographic approach has merit. The approach is based on high temperature pyrolysis of the water sample followed by immediate gas chromatographic separation of the resulting organic fragments. The amounts of these separated fragments are then measured with a hydrogen flame ionization detector. Through mathematical treatment utilizing all pyrographic peaks, the recorded pyrogram can be interpreted in terms of concentrations of the original organic components. Application of the technique to solutions containing a total of 100 ppm glycerol, DL-valine, and hexanoic acid in various ratios gave a standard deviation of 1.7 ppm. The sensitivity of the technique is sufficient to detect oil pollution levels of less than 10 ppm. (Mortland-Battelle)
W71-11975

USE OF AZURE A INSTEAD OF METHYLENE BLUE FOR DETERMINATION OF ANIONIC DETERGENTS IN DRINKING AND SURFACE WATERS,
Instituut voor Gezondheidstechniek TNO, Delft (Netherlands).
W. A. M. den Tonkelaar, and G. Bergshoeff.
Water Research, Vol 3, p 31-38, 1969. 4 fig, 3 tab, 10 ref.

Descriptors: *Detergents, *Surface waters, *Potable water, *Alkylbenzene sulfonates, *Linear alkylate sulfonates, Chemical analysis.
Identifiers: *Tetrapropylene benzene sulfonate, *Lauryl sulfonate, Azure A, Methylene blue.

Because of time requirements, unsatisfactory sensitivity, and positive interferences by several substances with the use of methylene blue for analysis of detergents in drinking water, experiments were conducted using azure A in place of the methylene blue. The anionic detergents used in the test were alkyl benzene sulfonate (ABS), tetrapropylene benzene sulfonates (TBS), linear alkylated sulfonate (LAS), and lauryl sulfate (LS). Graphs and tables are included with the discussion of absorption spectra, extraction, pH, reagent blanks, precision, sensitivity calibration for ABS, TBS, LAS, and LS, interferences, and applications. The tests indicate that the azure A method is more rapid, more sensitive and more selective for detergents in drinking and surface waters. However, further investigation is required for the application of the method to sewage. Details of the procedure employed in anal-

ysis of drinking and surface waters are given. (Little-Battelle)
W71-11977

AQUATIC MONITORING PROGRAMMES,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
A. Preston.
In: Environmental Contamination by Radioactive Materials, Proceedings of Joint Seminar held Mar 24-28, 1969, Vienna, Austria: International Atomic Energy Agency (STI/PUB/226), Paper SM-117/51, p 309-324, 1969. 16 p, 5 tab, 51 ref.

Descriptors: *Monitoring, *Radioactive wastes, *Water pollution sources, Critical path method, Path of pollutants, Planning, Regulation, Water pollution control, Hazards, Radioactive waste disposal.
Identifiers: Radioactive waste monitoring.

The design and development of aquatic radioactivity monitoring programs are reviewed. Today they are largely concerned with the assessment of the public health consequences of environmental contamination resulting from controlled waste disposal operations. The most efficient planning and execution of such operations can be achieved by use of the critical pathway approach from the very beginning of the problem, including the initial hazard assessment. It is perfectly feasible, with existing knowledge of radionuclide behavior, to identify critical pathways at a planning stage. A few years of operation will then confirm the important routes and provide the data on which to adjust monitoring commitments to the scale of the contamination. Complete relaxation of monitoring requirements may then become possible if certain limitations on effluent composition are observed. The opposite approach, where control is based from the start on discharge limitations, without due regard to the environment, should be treated with caution. The ultimate attractions to the specific activity approach are considerable, particularly in the case of some radionuclides such as cesium-137, because of the possibility of setting maximum permissible concentrations in sea water. (See also W71-11979) (Knapp-USGS)
W71-11981

INVESTIGATION OF THE RADIOACTIVITY OF THE DANUBE,
Institut za Nuklearne Nauke Boris Kildric, Belgrade (Yugoslavia). Dept. of Radiation Protection.
For primary bibliographic entry see Field 05B.
W71-11982

FIELD MONITORING AND INVESTIGATIONS FOR THE EVALUATION OF PUBLIC HEALTH HAZARDS THROUGH CONTAMINATION OF WATER SOURCES,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 05B.
W71-11983

MONITORING OF THE AQUATIC ENVIRONMENT OF THE UNITED KINGDOM AND ITS APPLICATION TO HAZARD ASSESSMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 05B.
W71-11984

RADIOCHEMICAL ANALYSES OF WATER SAMPLES COLLECTED ON AMCHITKA ISLAND, ALASKA,
Geological Survey, Denver, Colo.
W. A. Beetem, C. L. Washington, V. J. Janzer, and L. J. Schroder.
Geological Survey Open-file Report USGS-474-123, 1971. 38 p, 1 fig, 3 tab, 4 ref.

Descriptors: *Radiochemical analysis, *Nuclear explosions, *Alaska, Chemical analysis, Analytical techniques, Surface waters, Groundwater, Data collections.
Identifiers: *Amchitka Island (Alaska).

Tritium, gross alpha, and gross beta data from the Amchitka Island, Alaska are presented. These data were obtained from water samples analyzed by the U. S. Geological Survey between October 1965 and November 1970. Analyses of samples are tabulated by increasing latitude and decreasing longitude of sampling points. The study area from which samples are reported lies within lat 51 deg 00 min and 52 deg 00 min N., and long 179 deg 30 min E. The radioactivity concentrations were determined to assess possible changes in concentrations due to nuclear detonations. (Woodard-USGS)
W71-11993

HYDROGRAPHIC OBSERVATIONS IN TAMPA BAY AND THE ADJACENT GULF OF MEXICO, 1967,
For primary bibliographic entry see Field 02K.
W71-11994

A FIELD METHOD FOR DETERMINATION OF ANION-ACTIVE SURFACTANTS IN WATER,
Institute of General and Municipal Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 02K.
W71-12044

A CASE STUDY OF MICROORGANIC CONTAMINANTS IN RIVER WATER,
Carnegie-Mellon Univ., Pittsburgh, Pa. Mellon Institute; and Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 05C.
W71-12073

PROCEDURES FOR DETERMINING THE EFFECTS OF DREDGED SEDIMENTS ON BIOTA--BENTHOS VIABILITY AND SEDIMENT SELECTIVITY TESTS,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
John E. Gannon, and A. M. Beeton.
Journal Water Pollution Control Federation, Vol 43, No 3, Part 1, p 392-398, 1971. 4 fig, 1 tab, 16 ref. Army Contract DACW 49-68-C-0042.

Descriptors: *Laboratory tests, *Benthic fauna, *Dredging, *Sediments, Viability, Aquatic life, Water pollution sources, Methodology, Great Lakes, Amphipoda, Water pollution effects, Mortality.
Identifiers: Open lake dumping, Pontoporeia affinis, Sediment selectivity.

Samples of surface sediments were obtained from Great Lakes harbors in Wisconsin, Illinois, Michigan, Indiana, Ohio, and New York. Sediment selectivity, under aquarium conditions, and viability tests, using Ponto-poreia affinis were conducted. The distribution of the amphipods and their mortality were attributed to the absence of native bacterial flora and insufficient DO of micro-stratified sediments, respectively. Sediments from Rouge River, Cleveland, Buffalo, Calumet, and Indiana harbors caused the highest mortality of amphipods. A suggestion is made that sediments dredged from harbors should not be dumped into the open lake water without prior determination of DO by Winkler titration or self-stirring oxygen electrode as well as determination of BOD and COD and concentrations of phenols, mercury, other heavy metals, and pesticides. (Wilde-Wisconsin)
W71-12093

THE NITRATE DILEMMA.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 02K.
W71-12122

WATER POLLUTION -- 1970, PART 2.
For primary bibliographic entry see Field 05G.
W71-12147

EFFECTS OF CHLORTETRACYCLINE FEEDING ON BOVINE RUMEN MICROORGANISMS,
Washington State Coll., Pullman. Dept. of Bacteriology.
For primary bibliographic entry see Field 05C.
W71-12241

5B. Sources of Pollution

PRESENCE OF POLYNUCLEAR AROMATIC HYDROCARBONS IN COASTAL WATERS AND THE POSSIBLE HEALTH CONSEQUENCES,
World Health Organization, Copenhagen (Denmark). Regional Office for Europe.
For primary bibliographic entry see Field 05C.
W71-11654

FREEL V OZARK-MAHONING CO (DAMAGES RESULTING FROM STREAM POLLUTION).
For primary bibliographic entry see Field 06E.
W71-11657

IN SITU MEASUREMENT OF RADIATION DOSE IN THE COLUMBIA RIVER,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
W. L. Lappenbusch, D. G. Watson, and W. L. Templeton.
Health Physics Journal, Vol 21, No 2, p 247-251, Aug 1971.

Descriptors: *Monitoring, *Measurements, *Operations, *Effluents, *Nuclear power plants, Water pollution, *Water pollution sources, Water pollution effects, Rivers, Disposal, Dilution, Dispersion, Aquatic life, Plankton, Ecology, Periphyton.
Identifiers: Hanford site, Columbia River, Waste disposal, Aquatic plants, Aquatic animals, Zoo plankton, Phytoplankton.

By the use of lithium fluoride thermoluminescent dosimeters, comparative environmental dose measurements were made in the Columbia River upstream from an atomic reactor effluent discharge site, near the point of discharge and at a location downstream from the effluent outfall. These dose estimates were related to water depth, periphyton biomass, and concentration of radionuclides in the periphyton. The periphyton growth upstream from the reactors and near the discharge site was greatest near the surface and decreased down to 6 m. This decline was attributed to mainly to reduced light penetration with increasing depth. The rise in biomass concentration at the river bottom (6 m) was perhaps due to greater deposition of sediments on the artificial substrates. In the area of incomplete effluent mixing near the outfall, greater turbidity, higher temperatures and the relatively high concentrations of chemical pollutants, such as chromium, may have contributed to the reduced periphyton growth. Chromium, present in the effluent through the addition of sodium dichromate to the reactor cooling water to inhibit corrosion, is toxic to fish, particularly in the hexavalent form. The average dose rate near the effluent discharge site was over 20 times that of the downstream location, but the mean concentration of radionuclides measured in the periphyton at the outfall was only about four times greater. The direct measurement of radiation dose with LiF offers a better means of estimating environmental radiation exposure in periphyton communities than could be obtained through measurement of radionuclide uptake. (Houser-NSIC)
W71-11664

RADIOLOGICAL STATUS OF THE GROUNDWATER BENEATH THE HANFORD PROJECT, JAN.--JUNE 1970,
Battelle-Northwest Lab., Richland, Wash.

T. H. Essig.
Availability: National Technical Information Service as BNWL-1539. $3.00 in paper copy, $0.95 in microfiche. BNWL-1539, December 1970. 23 p.

Descriptors: *Groundwater, *Groundwater movement, *Hydrogeology, Water pollution, Radioactivity, Effluents, Waste disposal, Monitor, On-site data collections, Measurements, Tritium, Radioisotopes.
Identifiers: Hanford site, Concentration, Drinking water.

An evaluation of Ru-106 and H3 concentration measured in the unconfined groundwater during the first half of 1970 shows that the zones of detectable contamination extends in an easterly to south-easterly direction as observed in the past. The few locations for which groundwater concentrations exceed the guide for Ru-106 were all within either the 200 E or 200 W areas. Water from only one well located outside of the 200 area fence indicated an H3 concentration greater than the concentration guide. The highest average concentration of Cr-51 measured in unconfined groundwater within or near the 100 area was less than 1% of the concentration guide. Concentration of uranium, the principal radionuclide observed in the 300 area groundwater, was less than 3% of concentration guide. Nitrate ion concentration greater than 10% of the Public Health Service recommended drinking water limits was observed in most groundwater samples from wells surrounding the 200 and 300 areas. However, water from these wells is not consumed by humans or animals. (Houser-NSIC)
W71-11665

PUBLIC HEALTH ASPECTS OF IODINE-129 FROM THE NUCLEAR POWER INDUSTRY,
John L. Russell, and Paul B. Hahn.
Availability: Supt. of Documents U.S. Govt. Printing Office, Washington, D.C. 20402. $0.50 per copy. Radiological Health Data and Reports, Vol 12, No 4, p 189-194, April 1971. 1 tab, 1 fig, 19 ref.

Descriptors: *Environment, *Population, *Environmental effects, Pollutants, Water pollution effects, Air pollution, *Water pollution sources, Ecology, Food chains, Nuclear power plants, Effluents, Iodine radioisotopes, Mammals.
Identifiers: Fuel reprocessing plants, Surveillance program.

The production of iodine-129 in nuclear power reactors and its subsequent environmental releases during fuel reprocessing represent a potential long-term public health problem. Because of its extremely long half-life, any discharged iodine-129 is essentially a permanent contaminant in the biosphere. This potential problem, its possible geographical scope, and the projected impact on population exposure are discussed along with data from measurements at nuclear power reactors and a fuel reprocessing plant. A concentration of 0.86 percent iodine-129 in total iodine produces the dose limit recommended by the Federal Radiation Council (FRC) for a suitable sample of an exposed population. The quantity of iodine-129 discharged from operating power reactors was estimated from measurements of iodine-131 discharges by calculating an iodine-129 to iodine-131 buildup ratio. This analysis showed that the iodine-129 discharge from operating power reactors was negligible. Measurements at a fuel reprocessing plant indicated that approximately 10 percent of the total iodine-129 inventory in spent fuel was discharged from the stack during the batch dissolution process. The liquid discharge concentrations were about 2 percent of the total iodine-129 inventory. Iodine-129 levels in deer thyroids taken in the reprocessing plant locality were about 40 percent of levels of FRC guidance for human thyroids. (BLH-NSIC)
W71-11666

THE PROPERTIES OF PERSISTENT OILS AT SEA,
Esso Petroleum Co. Ltd., London (England); and British Petroleum Co. Ltd., Sunbury-on-Thames (England). Research Centre; and Shell Research Ltd., London (England); and Shell International Petroleum Co. Ltd., London (England).
For primary bibliographic entry see Field 05A.
W71-11677

ANALYSIS OF BEACH POLLUTANTS,
British Petroleum Co. Ltd., Sunbury-on-Thames (England). Research Centre.
For primary bibliographic entry see Field 05A.
W71-11678

MERCURY POISONING (OR) THE FISH YOU CATCH CAN KILL YOU.

Field and Stream, Vol 75, No 3, p 44-45, 49-51, July 1970.

Descriptors: *Heavy metals, *Fish, Lake Huron, Lake Erie, St. Lawrence River, Commercial fishing, Sport fishing, Toxicity.
Identifiers: *Lake St. Clair, *St. Clair River, *Mercury, Detroit River, Wabigoon River (Canada), Clay Lake (Canada), Lake Winnipeg (Canada), Saskatchewan River (Canada), Cedar Lake (Canada), Howe Sound (Canada), Lake St. Francis (Canada), Ball Lake (Canada), Indian Lake (Canada), Grassy Narrows Lake (Canada), Lount Lake (Canada), Separation Lake (Canada), Umfreville Lake (Canada), Tetu Lake (Canada), Swan Lake (Canada), Eaglenest Lake (Canada), Canada, Biological magnification.

The discovery is traced of mercury in fish in Lake St. Clair and in many other lakes and rivers in Canada and the United States. The sources, levels, effects of, and reactions to the identification of mercury contamination are also reviewed. (Little-Battelle)
W71-11682

THERMAL POLLUTION,
John Frye.
Sea Frontiers, Vol. 16, No. 2, p 85-95, March/April 1970. 6 fig.

Descriptors: *Thermal pollution, *Water pollution effects, *Aquatic insects, Electric powerplants, Nuclear powerplants, Fish, Cooling towers, Cooling water, Hydraulic models.

Because of the need for cooling water, expansion of industries, especially power plants, is certain to add to the thermal load of natural waters unless alternate cooling methods are found. About 16 nuclear power plants are in operation in the U.S. with 40 definitely planned. These will add tremendous amounts of heat to waters if once-through cooling is used. At present, few of the actual effects of thermal pollution are definitely known. A number of detrimental effects, such as prevention of salmon spawning, killing of vital organisms in food chains, and disruption of biological cycles have been projected and in some cases observed on limited scales. On the other hand, some beneficial effects, such as increases in biota and consequent improved fishing have been observed at other locations. Several model studies are being conducted where large power plants are planned. Unfortunately these studies provide quantitative answers but no biological answers. Cooling towers are often considered an alternate method of cooling but there are disadvantages associated with these, mainly cost of construction. Since past experience has shown that repair of environmental damage often proves to be difficult to justify after it has occurred, control of this potential problem must be maintained. (Little-Battelle)
W71-11683

HOW AERIAL PHOTOGRAPHS CAN IDENTIFY AND MEASURE POLLUTANTS,
Cornell Aeronautical Lab., Buffalo, N.Y.
For primary bibliographic entry see Field 05A.
W71-11685

REMOTE MEASUREMENT OF OCEAN COLOR AS AN INDEX OF BIOLOGICAL PRODUCTIVITY - A PRELIMINARY SUMMARY REPORT,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05A.
W71-11686

CHLORINATED HYDROCARBON PESTICIDES IN REPRESENTATIVE FISHES OF SOUTHERN ARIZONA,
California Univ., Berkeley, Bodega Marine Labs., and Arizona State Health Dept., Phoenix, Pesticide Lab.
For primary bibliographic entry see Field 05C.
W71-11690

POLLUTION POTENTIAL OF SALMONID FISH HATCHERIES.
Washington Univ., Seattle. Water and Air Resources Div.

Water and Sewage Works, Vol. 117, No. 18, p 291-297, August 1970. 6 fig, 3 tab, 15 ref.

Descriptors: *Fish hatcheries, *Salmonids, *Water pollution sources, *Biochemical oxygen demand, *Dissolved oxygen, *Hydrogen ion concentration, *Ammonia, *Nitrates, *Phosphates, *Solid wastes, *Animal wastes (Wildlife), Water pollution control, Food abundance, Chemical oxygen demand, Pathogenic bacteria, Animal parasites, Silts.
Identifiers: *Feces, Drugs.

The water pollution potential of salmonid hatchery operations was studied by surveying the literature, by questionnaire surveys, and by field tests. The study began in February 1969, and ended in February 1970. Pollution problems reported to be associated with fish hatchery operations included nutritional enrichment, algae and weed growth, taste and odor, settleable solids, pathogenic bacteria and parasites organic matter, chemicals and drugs. The literature review produced no positive results. The questionnaire survey revealed that 13 of 46 hatcheries responding indicated that they have had pollution problems. Field tests were conducted at the Green River Salmon Hatchery and the Kowlitz Trout Hatchery in the state of Washington to determine COD, BOD, and DO, pH, ammonia, nitrate, phosphate, suspended solids, dissolved solids, settleable solids, total solids, and total volatile solids. It was determined that the greatest pollution occurred during pond cleanout, and the most prevalent pollutants were fish fecal wastes and residual food. The result of the discharge of these pollutants was that: (1) the dissolved oxygen level was lowered in the effluent, (2) nutrient pollutants (Nitrate and phosphate) resulting from decomposition of fish food were increased, (3) solid pollutants both dissolved and settleable were significantly increased. It was further found that there were relationships between pollutant production rates, feeding rates, fish size, loading densities, and water supply rates. (Little-Battelle)
W71-11694

ENTEROPATHOGENIC ESCHERICHIA COLI SEROTYPES FOUND IN SEWAGE LAGOONS (WASTE STABILIZATION PONDS) IN NORTH DAKOTA,
North Dakota State Dept. of Health, Grand Forks. Div. of Labs.
For primary bibliographic entry see Field 05A.
W71-11709

BLACK SEA MICROORGANISMS GROWING ON HYDROCARBONS,
Institute of Biology of Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 05A.
W71-11712

MOVEMENT OF BACTERIA FROM A RIVER TO A MUNICIPAL WELL--A CASE HISTORY,
Geological Survey, Albany, N.Y.
Allan D. Randal.

Journal of the American Water Works Association, Vol 62, No 11, p 716-720, Nov 1970. 5 fig, 4 ref.

Descriptors: *Coliforms, *Water pollution sources, *Water quality control, *Water wells, New York, Sewage, Cultures, Excavation, Infiltration.
Identifiers: Susquehanna River (New York).

A municipal well in Endicott, New York, has operated without problem for 19 years when coliform bacteria were detected in weekly water samples. The apparent source is the sewage polluted Susquehanna River, 180 feet away, which was excavated in an area already geologically favorable for induced infiltration. Several general inferences were drawn from the study of this problem: (1) Although bacteria in river water were normally removed by filtration through riverbed and aquifer materials, they can move at least 180 feet to a municipal well under some conditions. (2) Riverbed excavations in the vicinity of wells should be avoided where possible and if unavoidable the backfill should be relatively impermeable. (3) Riverbank wells that already derive a large part of their water from nearby induced infiltration are the most susceptible to bacterial pollution in the event of riverbed excavation or increased withdrawal rates. (Mortland-Battelle)
W71-11716

MORTALITY OF ESTUARINE ANIMALS DUE TO COLD ON THE GEORGIA COAST,
Georgia Univ., Sapelo Island. Marine Inst; and Georgia Univ., Athens. School of Veterinary Medicine.
Michael D. Dahlberg and Frederick G. Smith.
Ecology, Vol 51, No 5, p 931-933, Late Summer 1970. 1 fig, 7 ref.

Descriptors: *Water temperature, *Freezing, Georgia, Estuaries, Salt marshes, Perches, Drums, Sampling Nets, Trawling, Shrimp, Mollusks, Rivers, Water pollution effects.
Identifiers: Weakfish, Croaker, Duplin River (Georgia), Doboy Sound (Georgia), Stellifer lanceolatus, Bairdiella chrysura, Larimus fasciatus, Micropogon undulatus, Cynoscion regalis, Penaeus setiferus, Atrina, Dinocardium robustum, Tellina alternata, Polinices duplicatus, Busycon canaliculata, Dosinia discus.

A cold wave on the Georgia coast in January, 1970 with temperatures of-10 C (15 C below normal minimum) was apparently fatal to some species of estuarine fishes and invertebrates. Dead fish left stranded in salt marshes by ebbing tides were collected and net samples were taken in rivers, creeks, tidal pools, and the surf zone of the seaward side of Sapelo Island. Mortality was low in most estuarine species but high in star drum and white shrimp in the Duplin River and Doboy Sound. Affected star drum and silver perch became weakened and lost their equilibrium. Most of these apparently died from suffocation or freezing when they were left stranded in the marsh by receding ebb tides. (Mortland-Battelle)
W71-11721

PYROPHYLLITE AND TALC IN WATERS OFF THE SOUTHEASTERN UNITED STATES,
Smithsonian Institution, Washington, D.C. Div. of Sedimentology.
J. W. Pierce, D. D. Nelson, and D. J. Colquhoun.
Marine Geology, Vol 11, No 2, p M9-M15, September 1971. 2 fig, 14 ref. NSF Grant GB 8189.

Descriptors: *Suspended load, *Sea water, *Atlantic Ocean, *Mineralogy, *Provenance, Water pollution sources, Currents (Water), Bottom sediments, Clay minerals, Costs.
Identifiers: *Talc, *Pyrophyllite.

Talc and pyrophyllite have been detected as suspended particulate in the water off the southeastern coast of the United States. The presence is attributed to industrial usage of these minerals rather than to natural erosion of the land or transport by ocean currents from the Gulf of Mexico. Loss may occur during processing by industry or the presence may be an indicator of use of the end product. (Knapp-USGS)
W71-11735

VERTICAL ADVECTION DIFFUSION AND REDOX POTENTIALS AS CONTROLS ON THE DISTRIBUTION OF MANGANESE AND OTHER TRACE METALS DISSOLVED IN WATERS OF THE BLACK SEA,
Woods Hole Oceanographic Institution, Mass.
D. W. Spencer, and P. G. Brewer.
Journal of Geophysical Research, Vol 76, No 24, p 5877-5892, August 20, 1971. 13 fig, 5 tab, 28 ref, append. USAEC Contract AT (30-1)-4150, NSF Grants GA-13574 and GA-1659.

Descriptors: *Metals, *Water chemistry, *Manganese, *Sea water, *Oxidation-reduction potential, *Solubility, Sulfides, Oxides, Chemical precipitation, Iron, Advection, Diffusion, Distribution patterns, Dissolved oxygen, Stagnant water, Oceanography, Copper, Water pollution sources.
Identifiers: *Black Sea, *Trace metals, Zinc.

Profiles of dissolved manganese, copper, iron and zinc show that the distribution of these elements are markedly affected by redox reactions at the boundary between oxygenated surface waters and the sulfide-containing deep waters. Copper and zinc are depleted in the deep water by precipitation as insoluble sulfides. The concentrations of manganese and iron in the deep water greatly exceed those of the surface water principally because of the greater solubility of the sulfides and hydroxides of the reduced species as compared with the solubility of hydroxides and oxides of the oxidized species. The distribution of dissolved nickel and cobalt does not appear to be greatly affected by redox reactions. The profile of dissolved manganese, which shows a pronounced mid-water maximum about 40 meters below the oxygen zero boundary, has been explained with the aid of a vertical advection-diffusion model. The Black Sea basin is currently acting as a very efficient trap for manganese. The concentration gradient between the maximum and the deep water is sufficient to drive an equivalent diffusive flux of manganese into the deep water. Manganese is not lost by upward diffusion and advection because the reduced species is oxidized and precipitated just above the oxygen zero boundary and hence adds to the total flux of particulate manganese into the deep water. Currently the total flux of particulate manganese that is going into solution in the deep water is about 875 mg per sq m per yr of which 675 mg is derived from the precipitation of dissolved manganese. (Knapp-USGS)
W71-11744

DISTRIBUTION OF PARTICULATE ALUMINUM IN THE GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Oceanography.
R. A. Feely, W. M. Sackett, and J. E. Harris.
Journal of Geophysical Research, Vol 76, No 24, p 5893-5902, August 20, 1971. 6 fig, 3 tab, 18 ref. NSF Grant GA-3918, ONR Contract Nonr 2119 (04).

Descriptors: *Water chemistry, *Aluminum, *Suspended load, *Gulf of Mexico, Sea water, Silicates, Clay minerals, Clays, Mineralogy, Sedimentation, Provenance, Water analysis, Tracers, Weathering, Oceanography, Water pollution sources, Path of pollutants.

Particulate aluminum, defined as the aluminum retained on 0.45 micron membrane filters, was determined fluorimetrically for 21 surface samples and 51 depth samples in 8 profiles from the Gulf of Mexico. The average concentration was 2.0 micrograms Al/liter. The ratio of particulate aluminum as aluminosilicate to total suspended material averaged 0.14 for the surface, decreased to 0.08 in the middle of the euphotic zone and then increased to 0.30 at depths down to 1000 meters. Most profiles showed an increase along the thermocline. Relatively low and similar values for inflow and outflow indicate that the Gulf of Mexico and its distributive province is a closed system with respect to aluminosilicates. Suspended matter in this study region is approximately 50% organic, 20% aluminosilicate, and 30% other inorganic material. (Knapp-USGS)
W71-11745

APPLICATION OF THE TELEGRAPH EQUATION TO OCEANIC DIFFUSION: ANOTHER MATHEMATICAL MODEL,
John Hopkins Univ., Baltimore, Md., Chesapeake Bay Inst.
For primary bibliographic entry see Field 02E.
W71-11753

POTASSIUM MIGRATION IN RIVER WATERS (O migratsii kaliya v rechnykh vodakh),
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analiticheskoi Khimii.
For primary bibliographic entry see Field 02K.
W71-11756

STATISTICAL POROUS MEDIA HYDRODYNAMICS,
Illinois Univ., Urbana. Dept. of Mining Metallurgy and Petroleum Engineering.
For primary bibliographic entry see Field 02F.
W71-11776

MIXING OF DENSITY-STRATIFIED IMPOUNDMENTS WITH BUOYANT JETS,
California Inst. of Tech., Pasadena. W.M. Keck Lab. of Hydraulics and Water Resources.
John David Ditmars.
California Institute of Technology, W.M. Keck Laboratory of Hydraulics and Water Resources Report No KH-R-22, September 1970. 203 p, 61 fig, 4 tab, 59 ref, append. FWPCA Grants No 16000 DGY and 16070 DGY.

Descriptors: *Impounded waters, *Mixing, *Density stratification, *Jets, *Diffusion, Model studies, Pumping, Tracers, Withdrawal, Laboratory tests, Analytical techniques, Fluid mechanics, Temperature, Mathematical studies, Equations, On-site investigations, Computer programs, Lakes, Reservoirs, Flow profiles, Path of pollutants, Water pollution sources.
Identifiers: *Buoyant jets, Plume patterns, Mixing forecasting.

A simulation technique was developed to predict the time-history of changes in the density-depth profiles of an impoundment during mixing. The simulation model considers the impoundment closed to all external influences except those due to the pumping system. The impoundment is treated in a one-dimensional sense, except for the fluid mechanics of the three-dimensional jet and selective withdrawal of the pumping system. The numerical solution to the governing equations predicts density profiles at successive time steps during mixing, given the initial density profile, the area-depth relations for the impoundment, the elevations of intake and jet discharge tubes, and the jet discharge and diameter. The changes due to mixing in the profiles of temperature and of a conservative, non-reacting tracer can be predicted also. The results of laboratory experiments and two field mixing experiments in which density-stratified impoundments were mixed using pumping systems show that the simulation technique predicts the response of the impoundment reasonably well. (Woodard-USGS)
W71-11780

ANALYSIS OF AIR-BUBBLE PLUMES,
California Inst. of Tech., Pasadena. W.M. Keck Lab. of Hydraulics and Water Resources.
Klas Cederwall and John D. Ditmars.

California Institute of Technology, W.M. Keck Laboratory of Hydraulics and Water Resources Report No KH-R-24, Sep 1970. 51 p, 18 fig, 1 tab, 9 ref. FWQA Research Grant No 16070 DGY.

Descriptors: *Mixing, *Air, *Stagnant water, *Air-water interfaces, Model studies, Flow characteristics, Mathematical studies, Equations, Analytical techniques, Density, Flow profiles, Atmospheric pressure, Velocity, Path of pollutants, Water pollution sources.
Identifiers: *Air-bubble plumes, *Plume patterns.

The air-bubble plume induced by the release of air into water is studied. The compressibility of the air and the differential velocity between the rising air bubbles and the water are introduced as basic properties of the air-bubble plume in addition to a fundamental coefficient of entrainment and a turbulent Schmidt number characterizing the lateral spreading of the air bubbles. Theroetical solutions for two and three- dimensional air-bubble systems in homogeneous, stagnant water are presented in both dimensional and normalized form and compared to existing experimental data. The further complication of a stratified environment is briefly discussed. (Woodard-USGS)
W71-11781

TRACE MATERIALS IN WASTES DISPOSED TO COASTAL WATERS-FATES, MECHANISMS AND ECOLOGICAL GUIDANCE AND CONTROL,
Federal Water Quality Administration, Corvallis, Oreg. National Coastal Research Program.
Milton H. Feldman.
Available from the National Technical Information Service as PB-202 346, $3.00 in paper copy, $0.95 in microfiche. Working Paper, No. 78, July 1970. 102 p, 20 fig, 17 tab, 137 ref. EPA Program 16070--07/70.

Descriptors: *Oceans, *Coasts, *Water quality control, Biomass, Toxicity, Eutrophication, Trace elements, Nitrogen, Phosphorus, Metabolism, Algae, Sludge, Analytical techniques, Industrial wastes, Municipal wastes, Metals, Heavy metals, Waste disposal, Water pollution effects.
Identifiers: *Trace organic contaminants, *Trace materials, Bioinhibition, Biostimulation.

Wastes currently being discharged to the coastal waters of the United States include Trace organic contaminants (TC), trace elements (TE), and other trace materials (TM). Those TM dealt with included: (1) known violently noxious materials; (2) materials which are biostimulatory to some species (cobalamin, iron chelates, thiamin, biotin, Mn, Mg; and (3) materials which are bioinhibitory for at least some species in various mechanisms (DDT, Se, Mn, Mg). A different view of the problem was taken in which ways of selecting the optimum organism to utilize a particular waste were preferred to methods of removing it conventionally. A thorough literature search revealed a significant lack of literature in waste breakdown for both qualitative and quantitative evaluation. Further studies should be performed for each known trace material to determine: (1) the mechanism whereby it is secluded; (2) the metabolic threshold; (3) the active level; (4) the harmful level; (5) the speciation requirements; (6) the absolute rates in and out of the compartments of which coastal waters, sediments, chemical system phases, and biota may be considered as composed. Evaluations such as these were performed for DDT, and they must be performed for the known set of waste constituents before rational action to prevent damage to the oceans is possible. (Lowry-Texas)
W71-11793

THE 50-MILE BALLAST-OIL DUMPING PROHIBITED ZONE OF ALASKA RECONSIDERED IN THE LIGHT OF AVAILABLE DATA GLEANED FROM SIGNIFICANT INCIDENTS,
Federal Water Quality Administration, Corvallis, Oreg. Pacific Northwest Water Lab.

For primary bibliographic entry see Field 05G.
W71-11796

MAN'S IMPACT ON THE GLOBAL ENVIRONMENT - ASSESSMENT AND RECOMMENDATIONS FOR ACTION.
Massachusetts Inst. of Tech, Cambridge.

The MIT Press, Cambridge, December 1970. 319 p.

Descriptors: *Water pollution effects, *Water pollution sources, *Analytical techniques, DDT, Heavy metals, Oil, Nutrients, Toxicity, Radioactive wastes, Phosphates, Nitrates, Crustaceans, Mollusks, Pesticide residues, Fish, Phosphorus, Eutrophication, Runoff, Lakes, Estuaries, Sampling, Monitoring, Data collections, Industrial wastes, Farm wastes, Domestic wastes.
Identifiers: *Mercury, DDE, Hydrocarbons.

This report of a one-month interdisciplinary Study of Critical Environmental Problems presents an assessment of the existing state of scientific recommendations for action that would reduce the harmful effects of pollution or would provide the information required to understand more adequately the impact of man on the global environment. The working groups that operated during this study considered climatic effects, ecological effects, monitoring, implications of change, industrial products and pollutants, domestic and agricultural wastes, and enzyme products. The report includes a summary of findings and recommendations and a detailed review of the work of each group. The group on ecological effects considered pesticides, mercury, oil, nutrients, and nuclear wastes, and the group on monitoring considered both chemical and biological monitoring. (Little-Battelle)
W71-11825

OIL POLLUTION OF THE OCEAN,
Woods Hole Oceanographic Institution, Woods Hole, Mass.
For primary bibliographic entry see Field 05A.
W71-11843

MATHEMATICAL MODEL OF THE COLUMBIA RIVER FROM THE PACIFIC OCEAN TO BONNEBILLE DAM, PART I: THEORY, PROGRAM NOTES, AND PROGRAMS,
Pacific Northwest Water Lab., Corvallis, Oreg.
R. J. Callaway, K. V. Byram, and G. R. Ditsworth.
Available from the National Technical Information Service as PB-202 422, $3.00 in paper copy, $0.95 in microfiche. Pacific Northwest Water Laboratory, Nov 1969, 155 p, 12 fig, 1 tab, 37 ref, 3 append. EPA Program 16070DBH. 11/69.

Descriptors: *Mathematical models, River systems, Water pollution sources, Estuaries, *Model studies, *Columbia River, Coasts, *Water temperature, *Heat budget, Heated water temperature, *Thermal pollution, Currents (water), Flow, *Simulation analysis, Advection, Diffusion, Date collections, Computer programs.
Identifiers: Coastal research, Heat exchange.

The Columbia River from the Pacific Ocean to Bonneville Dam is treated as a series of two-dimensional finite elements in the formulation of a mathematical model of the system. Currents and stages are simulated along the river via an explicit solution of the one-dimensional equations of motion and continuity; two-dimensional conditions in the horizontal are approached by means of a branched network of connecting channels and junctions. Computed net velocities and stages are used as input to the advection-diffusion equation and solutions are obtained for any coupled (e.g., BOD-DO) or uncoupled, first order reaction, conservative and/or non-conservative substance. Emphasis is placed on obtaining a solution for temperature as the dependent variable. Allowance is made for input of meteorological variables and a stepwise heat budget computation is made in order to predict temperature conditions on an hourly basis. A discussion of some existing pollution models, numerical methods and error sources is given; computer programs and program notes are listed. (See also W71-11868)
W71-11867

MATHEMATICAL MODEL OF THE COLUMBIA RIVER FROM THE PACFIC OCEAN TO BONNEVILLE DAM, PART II: INPUT-OUTPUT AND INITIAL VERIFICATION PROCEDURES,
Pacific Northwest Water Lab., Corvallis, Oreg.
R. J. Callaway, and K. V. Byram.
Available from NTIS as PB-202 423, $3.00 in paper copy, $0.95 in microfiche. Pacific Northwest Water Laboratory, Apr 1971, 130 p, 12 fig, 4 tab, 5 ref. EPA Program 16070DBH 04/71.

Descriptors: *Mathematical models, Estuaries, *Columbia River, *Model studies, *Input-output analysis, Water temperature, Currents (water), Flow, Heat budget, River systems, Water pollution sources.
Identifiers: Coastal research.

The numerical model of the Columbia River system described in detail in Part I is illustrated in Part II by specific examples of input-output on test cases - these cases thus serve as a user's guide. Preliminary verification of the model is discussed; conclusions and recommendations for future work are described. (See also W71-11867)
W71-11868

SOIL POLLUTION: EROSION EFFECTS IN SOIL.
Defense Documentation Center, Alexandria, Va.

Available from the National Technical Information Service as AD-722 900, $6.00 in paper copy, $0.95 in microfiche. Report DDC-TAS-71-8, April 1971. 431 p.
Identifiers: *Bibliographies, *Erosion, *Soils, Erosion, Abstracts, Beaches, Seacoast, Soil mechanics, Rivers, Geology, Hydrology, Water waves, Sand, Rock (Geology), Sedimentation, Avalanches, Construction, Floods, Mountains.

This bibliography contains references to reports on the presumably damaging effects of erosion on the regolith. Erosion by wind, water, ice, avalanches, landslides, earthquakes, heliocopter rotor downwash, exhaust gases, and other forces is represented. Procedures for the protection, stabilization, preservation, and restoration of earth materials exposed to erosion are included. The entries are a selection of references to unclassified and unlimited reports processed into the Defense Documentation Center data bank from January 1953 through December 1970. Corporate Author-Monitoring Agency, Subject, Title, Personal Author, Contract, and Report Number Indexes are provided.
W71-11873

MERCURY IN THE ENVIRONMENT.

Environmental Science and Technology, Vol 4, No 11, p 890-892, November 1970. 2 ref.

Descriptors: *Toxicity, *Path of pollutants, *Analytical techniques, Instrumentation, Neutron activation analysis, Public health, Polarographic analysis, Spectroscopy, Spectrophotometry, Industrial production.
Identifiers: *Mercury, Methylation, Atomic absorption analysis, Mercury compounds.

The threat of mercury in the environment, its various forms of mercury, toxicity, methylation, and entry into the food chain are discussed. The symptoms and effects of mercury poisoning are noted; the effects being reversible, irreversible or fatal. Mercury enters the environment from nature and man, equally. Man and man's activities account for only 50 percent of the mercury in water. The normal loss from rocks contributes an equal amount of

mercury to the environment. Atomic absorption and neutron activation are the preferred analytical techniques for the determination of mercury in various materials. Four methods for restoring mercury contaminated lakes are suggested. The production, import, export consumption, and inventory discrepancy of mercury for the years 1944-1958 is given. The cumulative discrepancy from 1944 to 1958 was 314,700 pounds of mercury. (McCann-Battelle)
W71-11878

GASTROINTESTINAL BACTERIA OF CERTAIN ANTARCTIC BIRDS AND MAMMALS,
Department of Supply, Melbourne (Australia). Antarctic Div.; and Melbourne Univ., (Australia). School of Microbiology.
Z. Soucek, and Rose Mushin.
Applied Microbiology, Vol 20, No 4, p 561-566, October 1970. 2 fig, 6 tab, 10 ref.

Descriptors: *Antarctic, *Diets, *E. coli, *Bioindicators, *Cultures, Birds, Mammals, Salmonella, Microscopy, Pseudomonas, Streptococcus, Chlorophyta, Crustaceans, Fish, Isolation.
Identifiers: Penguins, Seals, Skua, Escherichia freundii, Citrobacter freundii, Enterobacteriacea, Aerobacter, Paracolobactrum, Agars, Alcaligenes faecalis, Proteus vulgaris, Streptococcus faecalis, Staphylococcus epidermis, Cephalopods, Lactose fermenting, Phillip Island.

An investigation was carried out of the aerobic gram-negative intestinal flora of 158 penguins, 30 skuas, and 66 seals from the Antarctic and sub-Antarctic zones and Phillip Island. Among penguins and seals, 17 percent and 11 percent respectively, were devoid of aerobic enteric organisms, but microscopic examination showed the presence of other bacteria. The coliforms outnumbered the paracolons and nonlactose-fermenting bacteria; irregular coliform types and Escherichia coli were predominant. The penguins presented a suitable subject to illustrate the influence of diet on intestinal flora. Among penguins from the Antarctic zone, which feed on crustaceae and fish, 21 percent were devoid of aerobic bacteria. In the sub-Antarctic region, where penguins feed on crustaceae, cephalopoda, and fish, the incidence of birds with negative specimens was 10 percent. Phillip Island penguins which feed mainly on small fish, showed the lowest figure of 4 percent. There was a marked difference in the type of coliform flora found in penguins from the three locations. The frequency of isolation of E. coli from birds in the Antarctic zone was 17 percent, from sub-Antarctic birds it was 53 percent, and from Phillip Island 73 percent. (Mortland-Battelle)
W71-11879

ENVIRONMENTAL POLLUTION,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
F. A. Butrico, F. A. Creswick, G. L. Culp, R. T. Jaske, and T. P. O'Farrell.
A Background Paper to be used at the Battelle-sponsored Atlantic Council at the Conference on 'Goals and Strategy to Environmental Quality Improvement in the Seventies', January 15-17, 1971, at Washington, D.C. December 1, 1970. 26 p, 4 fig, 3 tab, 38 ref.

Descriptors: *Water quality control, *Municipal wastes, *Water treatment, *Industrial wastes, *Oil, Farm wastes, Nutrients, Runoff, Sediments, Pseudomonas, Mycobacteria, Acid, Mine water, Radioactive wastes, Sewers, Thermal pollution, Pesticides, Detergents, Heavy metals.
Identifiers: Corynebacterium, Nocardia, Streptomyces, Penicillium, Candida, Micrococcus, Mercury.

Major sources of pollution and their effects on the water supply are briefly reviewed. These include municipal, industrial, thermal, agriculture, mining, radioactive, and watercraft wastes; silt; petroleum products; hazardous substances; and combined sewers. Brief consideration is given to methods of dealing with these problems and the potential costs of reducing or eliminating pollution. (Mortland-Battelle)
W71-11882

IDENTIFICATION OF CRUDE OILS BY THEIR GAMMA SPECTRA FOLLOWING NEUTRON IRRADIATION,
Wyoming Univ., Laramie. Dept. of Physics.
For primary bibliographic entry see Field 05A.
W71-11900

MAY BE INESCAPABLE--MEDDLESOME MERCURY.

Science News, Vol 99, p 7, January 2, 1971. 1 fig.

Descriptors: *Industrial wastes, *Pulp and paper industry, *Toxicity, Lake Erie, Pulp wastes, Coals, Oil, Fish, Food chain, Detergents, Trace elements, Path of pollutants.
Identifiers: *Mercury, Lake St. Clair, San Joaquin River, Hydrocarbons, Chlorine-alkali plants, NTA.

A brief review of the sources of mercury in the environment and of means of controlling mercury pollution are presented. The largest industrial use of mercury is in chlorine-alkali plants, and pollution from this source has been largely halted. Other sources are much more difficult to identify and control. It is suggested that one means of controlling human intake is through careful selection of smaller species of fish for food since mercury concentrates in organisms up the food chain. There has been little research on the effects of low-level chronic doses of mercury and little work on possible synergistic effects. It is known that the toxicity of methyl mercury is greatly increased in combination with NTA. (Mortland-Battelle)
W71-11910

HYPNODINIUM-LIKE ALGAL BLOOMS IN GEORGIA LAKES,
Georgia Water Quality Control Board, Atlanta; and Georgia State Univ., Atlanta. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W71-11914

IODINE IN THE ENVIRONMENT,
National Institute of Arthritis and Metabolic Diseases, Bethesda, Md.
Robert L. Vought, Freddie A. Brown, and W. T. London.
Archives Environmental Health, Vol 20, p 516-522, April 1970. 2 fig, 1 tab, 20 ref.

Descriptors: *Analytical techniques, *Water analysis, *Nutrient requirements, Water treatment, Sewage treatment, Sewage effluents, Soil analysis, Maryland, Gasoline, Oil.
Identifiers: *Iodine, Washington, D.C.

Samples of air, vegetation, soil, and water (from the Washington, D.C. treatment plant in Potomac, Md.) were taken and chemically analyzed for the presence of iodine. Determination of iodine sources showed that the use of gasoline and oil can increase atmospheric iodine. Sedimentation treatment of water supplies extracts some iodine from raw water, but sewage plants concentrate iodine and return it to the environment via sewage effluent. Investigation of the iodine cycle in nature showed that minute amounts of iodine are usually present in the atmosphere but not in sufficient amounts to contribute substantially to body requirements. (Mortland-Battelle)
W71-11928

SYNERGISTIC FALSE-POSITIVE COLIFORM REACTION ON M-ENDO MF MEDIUM,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
L. J. Schiff, S. M. Morrison, and J. V. Mayeux.
Applied Microbiology, Vol 20, No 5, p 778-781, November 1970. 2 tab, 7 ref.

Descriptors: *Coliforms, *Membrane processes, *Rivers, Chromatography, Organic compounds, Microbiology, Colorado, Cultures.
Identifiers: *M-Endo MF medium, *False-positive reactions, Cache la Poudre River (Colorado), Propionaldehyde, Acetaldehyde.

The reported occurrence of synergistic false-positive coliform reactions on M-Endo MF medium was investigated. The objectives of the study were (1) to isolate populations of bacteria which produced such false-positive reactions, (2) to determine whether false-positive sheen reactions are a result of synergistic interaction, and (3) to determine the metabolic intermediates involved in false-positive sheen production. Samples of river water were subjucted to coliform analysis by the membrane filter technique with M-Endo MF medium. Suspect sheen-forming colonies were analyzed to determine purity and identity of cultures. Mixed cultures were separated, and individual isolates were examined for sheen production. The isolates not producing a sheen were recombined and tested further for sheen production. Those mixtures reproducing the sheen were characterized biochemically and tested to determine the metabolic intermediates involved. Chromatographic analysis of the metabolites showed that individual isolates produced an assortment of neutral organic compounds including 2-butanone, 2,3-butanedione, formaldehyde, and butyraldehyde, whereas acetaldehyde or propionaldehyde was produced only by the mixed cultures. Tests showed that both propionaldehyde and acetaldehyde could react to produce a sheen on M-Endo medium. The conclusion was reached that synergistic false-positive coliform reactions do indeed occur on M-Endo MF medium. (McCann-Battelle)
W71-11932

GROWTH RESPONSES OF ESCHERICHIA COLI TO THE SURFACTANT DODECYL BENZENE SULFONATE,
California State Coll., Los Angeles. Dept. of Microbiology and Public Health.
Vincent A. Pollack, and Dean A. Anderson.
Applied Microbiology, Vol 20, No 5, p 727-733, November 1970. 3 fig, 5 tab, 32 ref.

Descriptors: *Bioindicators, *Surfactants, *E. coli, *Cultures, *Growth rate, Sulfonates, Slime.
Identifiers: Sodium dodecyl benzene sulfonate.

Results of other investigations showing that the growth of certain gram-negative bacteria is affected by surfactants, specifically in causing production of slimes, led to the present investigation in which E. coli 11303 was exposed to sodium dodecyl benzene sulfonate (NaDDBS). The results show that after 20 to 24 hours of incubation, the cultures become slimy and viscous, and an addition of ethanol to the supernatant liquid yields a distinctive white, fibrous precipitate. The production of this material was shown to be dependent on the presence of NaDDBS in the medium. This precipitate from E. coli ATTC 11303 was found to contain 41 to 53 percent protein, 10 to 11 percent deoxyribonucleic acid, 6.8 to 7.4 percent ribonucleic acid, 15 to 25 percent carbohydrate, and 9 percent lipid. It is distinctive from naturally occurring E. coli slimes in several respects. The data suggest that its formation is the primary result of the leakage of intracellular components into the medium. However, the rate of cell proliferation indicates a partial but not complete or lethal lysis. A limit utilization of NaDDBS as a carbon source was also shown. (Little-Battelle)
W71-11933

FORMATION OF 'PHOTODIELDRIN' BY MICROORGANISMS,
Wisconsin Univ, Madison. Dept. of Entomology.
F. Matsumura, K. C. Patil, and G. M. Boush.
Science Vol 170, No 3963, p 1206-1207, December 11, 1970. 1 fig, 1 tab, 11 ref.

Descriptors: *Dieldrin, *Water pollution sources, *Animal metabolism, Microorganisms, Animal

physiology, Silts, Soil microorganisms, Gas chromatography, Toxicity, Analytical techniques, Aquatic microorganisms.
Identifiers: *Photodieldrin, Lake Michigan, Thin-layer chromatography.

Photodieldrin, the major conversion product of dieldrin by sunlight, was found among the metabolic contents of dieldrin in microorganisms isolated from various environments including soil, water, silt, rat intestines, and rumen stomach contents of a cow. Water and silt were taken from Lake Michigan. Thin-layer chromatography and two different gas-liquid chromatography systems were used to identify photodieldrin. More information on the toxicology properties of photodieldrin is needed, since the changes are great that this compound can form dieldrin in various water and soil systems. (Mortland-Battelle)
W71-11940

SCIENTIFIC FUNDAMENTALS OF THE EUTROPHICATION OF LAKES AND FLOWING WATERS, WITH PARTICULAR REFERENCE TO NITROGEN AND PHOSPHORUS AS FACTORS IN EUTROPHICATION,
Organization for Economic Co-Operation and Development Paris (France).
For primary bibliographic entry see Field 05C.
W71-11942

SCIENTIFIC FUNDAMENTALS OF THE EUTROPHICATION OF LAKES AND FLOWING WATERS, WITH PARTICULAR REFERENCE TO NITROGEN AND PHOSPHORUS AS FACTORS IN EUTROPHICATION--ANNEX,
Organization for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 05C.
W71-11943

EUTROPHICATION OF NORTHEASTERN OHIO LAKES: I INTRODUCTION, MORPHOMETRY, AND CERTAIN PHYSICO-CHEMICAL DATA OF DOLLAR LAKE,
Kent State Univ., Ohio. Inst. of Limnology.
For primary bibliographic entry see Field 05C.
W71-11949

INFRARED SCANNING TRACES POLLUTION.

Water and Sewage Works, Vol. 117, No. 3, p 73, March 1970. 2 fig.

Descriptors: *Thermal pollution, *Remote sensing.
Identifiers: *Infrared line scanner, *Daedalus Enterprises, Inc.

A brief description is given of a new infrared line scanning system which may be used for surveying forest and mineral resources, agricultural and grazing lands, and urban areas; pinpointing sources of pollution, and conducting engineering surveys. The main feature of the system is that magnetic tape is used instead of photographic film for recording the infrared signals. Variation of tape playback provides imagery which emphasizes selected aspects of the scene scanned. A photograph of thermal effluents along the St. Clair and Detroit Rivers is included. (Little-Battelle)
W71-11962

TRISODIUM NITRILOTRIACETATE AND ALGAE,
For primary bibliographic entry see Field 05C.
W71-11972

RELATIVE IMPORTANCE OF WATER AND SOIL IN THE INDIRECT RADIOCAESIUM AND RADIOCOBALT CONTAMINATION OF IRRIGATED RICE FIELDS (Importance relative de l'eau et du sol dans la contamination indirecte en radiocesium et radiocobalt des rizieres irriguees),
European Atomic Energy Community, Ispra (Italy). Center of General Research; Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
C. Myttenaere, Ph. Bourdeau, and R. Bittel.
In: Environmental Contamination by Radioactive Materials, Proceedings of Joint Seminar held Mar 24-28, 1969, Vienna, Austria: International Atomic Energy Agency (STI/PUB/226), Paper SM-117/5, p 175-182, 1969. 8 p, 1 fig, 4 tab, 15 ref.

Descriptors: *Path of pollutants, *Irrigation water, *Soil water, *Cesium, *Cobalt radioisotopes, Radioisotopes, Fallout, Rice, Chelation, Adsorption, Mineralology, Clay minerals, Soil-water-plant relationships, Ion transport.
Identifiers: Cesium radioisotopes.

Tests involving models of irrigated rice fields with double labelling for each element show that transfer to the plant from the water is much greater than from the soil (by a factor of 7-12 in the case of cobalt and 30-100 in that of cesium). The water-plant transfer rates are comparable to those obtained in agriculture. The soil fixes two elements strongly. EDTA reduces radioactive cobalt fixation and its adsorption by the plant, thus leading to transport of the contamination over a greater distance. (See also W71-11980 thru W71-11984) (Knapp-USGS)
W71-11979

AQUATIC ASPECTS IN CHRONIC AND ACUTE CONTAMINATION SITUATIONS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 05C.
W71-11980

AQUATIC MONITORING PROGRAMMES,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 05A.
W71-11981

INVESTIGATION OF THE RADIOACTIVITY OF THE DANUBE,
Institut za Nuklearne Nauke Boris Kildric, Belgrade (Yugoslavia). Dept. of Radiation Protection.
T. Tasovac, and R. Radosavljevic.
In: Environmental Contamination by Radioactive Materials, Proceedings of Joint Seminar held Mar 24-28, 1969, Vienna, Austria: International Atomic Energy Agency (STI/PUB/226), Paper SM-117/88, p 427-433, 1969. 7 p, 4 fig, 2 tab, 5 ref.

Descriptors: *Path of pollutants, *Radioactive wastes, *Fallout, *Monitoring, Rivers, Streamflow, Runoff, Radioisotopes, Radioactivity, Water analysis, Surveys, Hydrology, Water pollution sources.
Identifiers: *Danube River.

As a part of the program for investigating the radioactivity content of the Danube and the distribution of radioactive nuclides in different components, systematic measurements of the total beta activity of water, suspended materials, bottom sediments, plankton, bottom biota, algae and fish, as well as gamma-spectrometric measurements, were made. The high correlation coefficients between fall-out and the total beta activity of water in the period of intense experiments with nuclear weapons show in the total beta activity in the river. Among the different parameters influencing the distribution of radioactivity in the river the most important are the hydrologic conditions of the river course. (See also W71-11979) (Knapp-USGS)
W71-11982

FIELD MONITORING AND INVESTIGATIONS FOR THE EVALUATION OF PUBLIC HEALTH HAZARDS THROUGH CONTAMINATION OF WATER SOURCES,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
P. R. Kamath, and I. S. Bhat.
In: Environmental Contamination by Radioactive Materials, Proceedings of Joint Seminar held Mar 24-28, 1969, Vienna, Austria: International Atomic Energy Agency (STI/PUB/226), Paper SM-117/53, p 435-447, 1969. 13 p, 12 tab, 16 ref.

Descriptors: *Monitoring, *Surveys, *Radioactive wastes, *Fallout, *Irrigation water, Water supply, Soil-water-plant relationships, Cesium, Strotium radioisotopes, Monsoons, Distribution patterns, Water pollution sources.
Identifiers: *India.

Extensive investigations are made to study the ecological cycling of Sr-90 and Cs-137 from weapons fallout. The Tarapur region of India comes under the influence of heavy monsoon rains, generally in the period of intense agricultural activity; most farming in other seasons is done with water from wells and reservoirs. The monsoons bring down 90-95% of the total annual fallout. The flushing effect of the downpour was studied by exposing soil blocks in situ and collecting the seepage during the three-months duration of monsoon rains. Of the 82 pCi Sr-90 pCi Cs-137 present in the total rains, only about 5% appeared in the effluents. Fresh fallout contaminations were also utilized to study uptake in farm produce, grass, farm animals and milk. The possible retention of released activity in salt produced by solar evaporation was studied in the laboratory with seawater spiked with fission and induced radionuclides. Sea-salt experiments for example have shown little Cs-137 even in crude salt, while considerable Sr-90 is retained. These studies indicate the priorities in land monitoring programs that may be usefully adopted at a site where contamination of surface and groundwater is likely from nuclear operations. (See also W71-11979) (Knapp-USGS)
W71-11983

MONITORING OF THE AQUATIC ENVIRONMENT OF THE UNITED KINGDOM AND ITS APPLICATION TO HAZARD ASSESSMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
N. T. Mitchell.
In: Environmental Contamination by Radioactive Materials, Proceedings of Joint Seminar held Mar 24-28, 1969, Vienna, Austria: International Atomic Energy Agency (STI/PUB/226), Paper SM-117/20, p 449-462, 1969. 14 p, 4 tab, 15 ref.

Descriptors: *Monitoring, *Radioactive wastes, *Water pollution sources, *Critical path method, Water pollution control, Sampling, Fallout, Radioactive waste disposal, Water analysis.
Identifiers: *United Kingdom.

The Fisheries Radiobiological Laboratory carries out monitoring of the aquatic environments of all of the major nuclear establishments in the United Kingdom except where drinking water is the primary route by which radioactivity returns to man. Monitoring programs are based on the critical path approach and a primary factor in their design is the identification of combinations of critical materials and critical radionuclides derived in the first instance from habitats and consumption surveys. Indicator materials also feature in programs, particularly in the early stages of operation of a site. The design of several monitoring programs in current use is given to illustrate how application of these principles works out in practice in a wide range of situations. These are grouped into the following categories according to whether public radiation exposure is (a) a significant fraction of the acceptable limit and can be assessed by direct measurement of critical materials; (b) not measurable in critical materials but can be quantitatively esti-

mated by examining indicator materials; (c) not measurable by any means. Recent monitoring data are used to assess the radiation dose received by specific critical groups. Even for the largest discharge to the sea (from Windscale) contamination is being controlled within acceptable limits. (See also W71-11979) (Knapp-USGS)
W71-11984

RADIOCHEMICAL ANALYSES OF WATER SAMPLES COLLECTED ON AMCHITKA ISLAND, ALASKA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05A.
W71-11993

HYDROBIOLOGY, 'BIORESOURCES OF SHALLOW WATER ENVIRONMENTS'.
For primary bibliographic entry see Field 07B.
W71-12029

REDUCED FLOWS AND THE FUTURE ECOLOGY OF THE SAN FRANCISCO BAY-DELTA SYSTEM,
California Univ., Davis. Inst. of Ecology.
Charles R. Goldman.
In: Hydrobiology, 'Bioresources of Shallow Water Environments,' Proceedings of Symposium, Miami Beach, Florida, June 24-27, 1970; American Water Resources Association, Urbana, Illinois, Proceedings Series No 8, p 174-190, 1970. 17 p, 6 fig, 1 tab, 16 ref.

Descriptors: *Estuaries, *Flow augmentation, *Environmental effects, *California, *Ecology, Bays, Streamflow, Ecosystems, Water quality, Salinity, Water balance, Eutrophication.
Identifiers: *San Francisco Bay, *Sacramento River, *San Joaquin River.

The great Delta area of the Sacramento and San Joaquin Rivers is an ecological continuum with the San Francisco Bay. The water course is continuous and the Bay-Delta System is an ecological unit whose margins are as indistinct as the ebb and flow of the tides and the fresh-water discharge which advances and retreats with the annual runoff. Natural changes or man's manipulation of the discharge of fresh-water into the Bay-Delta System will alter the character of both the Delta and the estuary below. This report summarizes some of the ecological implications of reduced fresh-water discharge on the Bay-Delta System. (See also W71-12029) (Woodard-USGS)
W71-12030

THE USE OF AERIAL PHOTOGRAPHY FOR HYDROBIOLOGICAL INVESTIGATIONS,
Eastman Kodak Co., Rochester, N.Y. Research Labs.
For primary bibliographic entry see Field 07B.
W71-12031

INFRARED AND MULTISPECTRAL SENSING IN HYDROBIOLOGICAL APPLICATIONS,
Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
For primary bibliographic entry see Field 07B.
W71-12032

REMOTE SENSING OF COASTAL ENVIRONMENTS USING MULTISPECTRAL PHOTOGRAPHIC TECHNIQUES,
Long Island Univ., Greenvale, N.Y.
For primary bibliographic entry see Field 07B.
W71-12033

COLOR INFRARED PHOTOGRAPHY FROM 60,000 FEET ALTITUDE AS A TOOL FOR DELINEATING AQUATIC VEGETATION,
National Aeronautics and Space Administration, Houston, Tex. Manned Spacecraft Center.
Curtis C. Mason.
In: Hydrobiology, 'Bioresources of Shallow Water Environments', Proceedings of Symposium, Miami Beach, Florida, June 24-27, 1970; American Water Resources Association, Urbana, Illinois, Proceedings Series No 8, p 317-328, 1970. 12 p, 6 fig.

Descriptors: *Remote sensing, *Aerial photography, *Infrared radiation, *Aquatic algae, *Surface waters, Analytical techniques, Photometry, Water pollution.
Identifiers: *Infrared photography, *Aquatic vegetation.

Color infrared (IR) photography with its ability to extend the range of photographic detectability into the near IR wavelength is an excellent tool for mapping aquatic vegetation. This vegetation appears in a broader range of color than on conventional color photography. Water appears as a very distinct blue or black sharply outlining the aquatic vegetation. Using high altitude aircraft permits coverage of large areas on a single mission. (See also W71-12029) (Woodard-USGS)
W71-12034

ARSENIC AND LEAD IN WATER - A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from the National Technical Information Service as PB-202 578, $3.00 in paper copy, $0.95 in microfiche. WRSIC 71-209, September, 1971, 80p, 69 ref.

Descriptors: *Arsenic compounds, *Heavy metals, *Water pollution, *Water chemistry, *Bibliographies, *Abstracts, Data storage and retrieval, Water quality, Publications, Documentation, Classification, Chemical analysis, Water analysis, Surface waters, Groundwater.
Identifiers: *Arsenic, *Lead.

This bibliography on arsenic and lead in water was retrieved from Selected Water Resources Abstracts published through August 15, 1971 (Volume 4, Number 12), by Water Resources Scientific Information Center, of the Office of Water Resources Research, U.S. Department of the Interior. The publication contains 69 abstracts. Each bibliographic entry includes title, author, source, descriptors, identifiers, abstract, and accession number. A permuted keyword-in-title index precedes the bibliography.
W71-12036

ON FACTORS AFFECTING THE QUALITY OF SUBSURFACE WATERS AROUND A POLLUTION SOURCE,
Belorussian Sanitary-Hygienic Research Inst., Minsk (USSR).
A. G. Kokina.
Hygiene and Sanitation, (Russian Translation), Vol 35, No 2, February 1970, p 181-185.

Descriptors: *Water quality control, *Organic wastes, *Bacteria, Phreatic water, Currents, Aquifers, Water wells, Industrial wastes, Mineral water, Chlorides, Salts, Water pollution sources, Path of pollutant.

Chemical and bacterial analyses were performed on water taken from 4 wells, which were 64, 220, 370, and 420 m respectively, from a pollution source. The study proceeded during a period of several years, when most of the pollution was produced by a meat packing plant. The water from the wells, which were 370 and 420 m from the pollution source was of consistently good bacteriological quality, while the closest well was not always of good quality, although it was quite obvious that there was significant protection for this well based on the reductions. These bacteriological investigations established that chemical considerations were probably of more concern, and chemical analyses verified that this hypothesis was correct. The predominance of the chemical pollution was attributed to the greater rapidity with which the chemical pollution spread, as compared to bacterial contamination. If investigations provide evidence of adequate natural aquifer protection, then wells even in the close proximity of the pollution source can be exploited. if there is inadequate protection, the water quality will depend upon the direction of the phreatic water stream, both natural and induced. (Lowry-Texas)
W71-12046

WATER QUALITY IN RELATION TO FARM USE OF FERTILIZER,
Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Div.
For primary bibliographic entry see Field 05C.
W71-12084

PROCEDURES FOR DETERMINING THE EFFECTS OF DREDGED SEDIMENTS ON BIOTA--BENTHOS VIABILITY AND SEDIMENT SELECTIVITY TESTS,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 05A.
W71-12093

5C. Effects of Pollution

STUDIES ON THE ASSIMILATION OF 1,1,1-TRICHLORO-2,2-BIS (P-CHLOROPHENYL) ETHANE (DDT) BY CRASSOSTREA VIRGINICA GMELIN,
Gulf Coast Research Lab., Ocean Springs, Miss.
Noel V. Brodtmann, Jr.
Bulletin of Environmental Contamination and Toxicology, Vol 5, No 5, p 455-462, 1970. 2 fig, 1 tab, 13 ref. NSF Grant GB-7585 Bur Comm Fish contract 14-17-0002-341.

Descriptors: *DDT, *Pesticide kinetics, *Pesticide residues, *Pesticide drift, *Path of pollutants, *Chlorinated hydrocarbon pesticides, *Absorption, Pesticides, Animal physiology, Water pollution effects, Physiological ecology, Environmental effects, Aldrin, Agricultural chemicals, Oysters.
Identifiers: DDD, DDE, Crassostrea sp., Mantle tissue, Gill tissue.

Uptake of DDT by the oyster, Crassotrea virginica, was studied in an attempt to isolate the entry point and to clarify an uptake mechanism. Both static and flowing water tests were utilized. It was determined that the gills are probably the primary entry site of DDT, while the gut may be of secondary importance. Mantle uptake of DDT was not demonstrated. Very rapid elimination of DDT residues was indicated, and the author noted that this may render the oyster's value as an environmental indicator organism questionable. (LeGore-Washington)
W71-11645

INFLUENCES OF KRAFT MILL EFFLUENTS ON THE PRODUCTION OF CHINOOK SALMON IN LABORATORY STREAM COMMUNITIES,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
James August Lichatowich.
Master of Science Thesis, June 1970. 52 p, 12 fig, 3 tab, 16 ref, 7 append. OWRR Project B-013-ORE (1).

Descriptors: *Water pollution effects, *Pulp wastes, *Chinook salmon, *Toxicity, Water pollution sources, Water quality, Environmental effects, Physiological ecology, Pulp and paper industry, Wood wastes, Bioassay, Organic wastes, Fish physiology, Fish diseases, Fishkill, Food chains, Seasonal, Aquatic environment, Mortality, Ecosystems, Fluctuation, Industrial wastes.
Identifiers: Acute toxicity, Seasonal effects.

A study of the effects of stabilized and unstabilized kraft mill effluents (KME) on the production of chinook salmon (Oncorhynchus tshawytscha) in six laboratory streams was conducted. Similar salmon biomasses were stocked in each stream and changes were measured every 14 days. Streams receiving 1.5 and 0.75% by volume of unstabilized waste (3 and 1.5 mg/l BOD, respectively) maintained the highest salmon biomasses. Acute toxicity bioassays of unstabilized wastes showed these effluents were more toxic in winter and in spring than in summer. Lower levels of toxicity probably minimized any direct effect of this effluent on fish growth during the summer and may have permitted increased invertebrate production. This perhaps explains the higher levels of salmon production obtained during this experiment as compared to those obtained in earlier experiments conducted by others during seasons other than the summer. (LeGore-Washington)
W71-11646

STUDIES OF THE COPPER CONTENT OF THE SEAWATER AND OYSTERS (CRASSOSTREA ANGUILATA) OF THE COASTS OF CADIZ (ESTUDIOS DEL CONTENIDO EN COBRE DEL AGUA DE MAR Y OSTIONES (CRASSOSTREA ANGULATA) DE LAS COSTAS DE CADIZ),
Instituto de Investigaciones Pesqueras, Cadiz (Spain).
Rafael Establier.
Investigacion Pesquera, Vol 33, No 1, p 69-86, January 1969. 2 fig, 6 tab, 20 ref. English summary.

Descriptors: *Survey, *Copper, Assay, Metals, Copper compounds, Oysters, Water quality, Water chemistry, Water pollution.
Identifiers: *Concentration factors, *Spain, Crassostrea sp.

The concentration of copper in the surface water and oysters (Crassostrea anguilata) of Cadiz coasts was determined over a period of 19 months. A definite seasonal trend was observed in the oysters of Zona Franca with a January-April maximum and with an average concentration of 7.01 mg Cu/100 g fresh body weight. The average concentration of copper in all samples of oysters analyzed from Sanlucar de Barrameda and Chipiona was 28.36 and 17.80 mg Cu/100 g fresh body weight, and 164.43 and 162.32 mg Cu/100 g dry weight, respectively. The average copper content of seawater was 4.97 mg/l for Zona Franca, 5.44 mg/l for Sanlucar de Barrameda, 5.53 mg/l for Chipiona, 5.60 mg/l for rio San Pedro, and 5.72 mg/l for Sancti-Petri. (LeGore-Washington)
W71-11647

ECOLOGICAL STUDIES OF RADIOACTIVITY IN THE COLUMBIA RIVER ESTUARY AND ADJACENT PACIFIC OCEAN,
Oregon State Univ., Corvallis. Dept. of Oceanography.
James E. McCauley.
Available from the National Technical Information Service as RLO-1750-54, $3.00 in paper copy, $0.95 in microfiche. Progress Report, reference 69-9 RLO 1750-54, July 1969. 316 p, 45 fig, 32 tab, 104 ref. AEC Contract AT (45-1)1750.

Descriptors: *Radioecology, *Radioactivity effects, *Tracers, *Water pollution effects, *Analytical techniques, *Path of pollutants, *Columbia River, *Physiological ecology, Biology, Radioactive waste, Radioisotopes, Tagging, Tracking techniques, Water pollution sources, Instrumentation, Bioindicators, Pulp wastes, Environmental effects, Reviews.
Identifiers: Radioanalytical techniques.

Seven years of research are summarized involving more than seventy separate but related projects relative to the radioecology of the Columbia River area. Radioecology is here defined as a study of the cycling of radionuclides between the water, sediment and biota. Included are reports on radioanalytical techniques, radioisotope contents of the Columbia River and its estuary, effects of effluents on radioisotopes, biological surveys, biological studies both with and without radioisotopes, and effects of radioisotopes on aquatic fauna. (LeGore-Washington)
W71-11648

BIOLOGICAL EFFECTS OF SURFACE ACTIVE AGENTS ON MARINE ANIMALS,
Kristinebergs Zoologiska Station, Fiskebackskil (Sweden).
M. Swedmark, B. Braaten, E. Emanualsson, and A. Granmo.
Marine Biology, Vol 9, No 3, p 183-201, May 1971. 24 fig, 1 tab, 36 ref.

Descriptors: *Bioassay, *Lethal limit, *Water pollution effects, *Detergents, *Surfactants, Water pollution treatment, Alkylbenzene sulfonates, Linear alkylate sulfonates, Sulfonates, Water softening, Physiological ecology, Pollutant identification, Toxicity, Animal physiology, Clams, Environmental effects, Aquatic environment, Cleaning, Fish physiology, Oysters, Invertebrates, Crabs.
Identifiers: Lauryl ether sulphate, Biological effects, Gadus sp., Pleuronectes sp., Mytilus edulis, Ostrea sp., Mya sp., Cardium sp., Astarte sp., Pecten sp., Balanus sp.

The biological effects of five surface active agents (the anionic ABS, LAS and LES 3 EO, and the nonionic NP 10 EO and TAE 10 EO) on marine fishes, crustaceans and bivalves have been tested in continuous-flow bioassay. Concentrations from 100 to 0.5 ppm were normally used. Fish were more susceptible than bivalves, while crustaceans were considerably more resistant. Within each of these three systematic groups, more active species were more sensitive than were less active species. Developmental stages were also more sensitive than adults. The most toxic agent for fish and decapods was the 'soft' anionic LAS, and for bivalves and barnacles the 'hard' nonionic NP 10 EO. Ability to recover normal behavior after exposure decreases with increasing concentration and time, and ceases earlier in anionic than in nonionic surfactants. The first reaction to the surfactants is increased activity (avoidance reaction in mobile species), followed successively by inactivation, immobilization and death. Sublethal effects are described. (LeGore-Washington)
W71-11651

PRESENCE OF POLYNUCLEAR AROMATIC HYDROCARBONS IN COASTAL WATERS AND THE POSSIBLE HEALTH CONSEQUENCES,
World Health Organization, Copenhagen (Denmark). Regional Office for Europe.
Michael J. Suess.
Revue Internationale d'Oceanographie Medicale, Vol 18-19, p 181-190, 1970. 4 tab, 46 ref.

Descriptors: *Aromatic compounds, *Water pollution sources, *Water pollution effects, *Public health, *Phytotoxicity, *Environmental sanitation, Organic compounds, Oil, Estuarine environment, Municipal wastes, Domestic wastes, Sewage, Waste disposal, Bioindicators, Biochemistry, Animal physiology, Plant physiology, Human diseases, Synthesis, Absorption, Marine animals, Food chains, Metabolism, Bioassay, Oily water.
Identifiers: *Polynuclear aromatic hydrocarbons, *PAH, *3-4 Benzopyrene, *Carcinogens, Residues, Metabolites, Bioconcentration, Accumulation, Marine sediments.

Carcinogenic polynuclear aromatic hydrocarbons (PAH) are distributed widely throughout the world, being equally found in coastal waters near heavily populated areas and in remote and unpopulated zones where little human activity occurs. While endogenic synthesis by flora appears to be a major contributor, PAH concentrations in estuaries and coastal waters may be further increased by industrial and municipal effluents and by atmospheric precipitation. The ability of marine fauna, serving as human food, to concentrate carcinogenic PAH has been demonstrated. Still, no clear evidence exists at present that waste effluents have become an actual environmental PAH-induced cancer hazard to the general population. Nevertheless, these wastes and seafood should be viewed with concern so as to forestall possible complication in the future. (LeGore-Washington)
W71-11654

EFFECTS OF SOME COMMON PRESERVATIVES ON THE WEIGHT OF TUBIFICID WORMS AND CHIRONOMID LARVAE,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
Richard P. Howmiller.
Center for Great Lakes Studies, unpublished manuscript, February 1971. 8 p, 3 fig, 4 ref.

Descriptors: *Sampling, *Preservation, *Alcohols, *Weight, *Surveys, *Biomass, Storage, Retardants, Tubificids, Oligochaetes, Worms, Annelids, Diptera, Analytical techniques, Data collections, Evaluation, Standing crop, Investigations, Test procedures.
Identifiers: *Fixation, *Formaldehyde, *Ethanol, *Isopropanol, Weight loss, Dry weight, Water pollution evaluation.

Reports of investigations of invertebrate macrobenthos often include estimates of standing crop expressed as dry or wet weight of organisms per unit area. Weighing of animals frequently follows prolonged storage in one or two preservatives of various content. The effects of three common preservatives (10% formalin, 70% ethanol, 70% isopropanol) on weights of tubificid worms and chironomid larvae are discussed. Weight decreased less in formalin than in ethanol, and most in isopropanol, although all fixatives caused great decreases in weight. Many of the published weight determinations and standing crop estimates based on work with preserved organisms is practically useless. Causes of variations in results are discussed. (LeGore-Washington)
W71-11655

SUPERSATURATION OF NITROGEN IN THE COLUMBIA RIVER AND ITS EFFECT ON SALMON AND STEELHEAD TROUT,
Bureau of Commercial Fisheries, Seattle, Wash.
Wesley J. Ebel.
U.S. Bureau of Commercial Fisheries, Fishery Bulletin, Vol 68, No 1, p 1-11, June 1969. 5 fig, 4 tab, 7 ref.

Descriptors: *Columbia River, *Water pollution effects, *Water pollution sources, *Supersaturation, *Nitrogen, *Gases, *Salmonids, *Fish diseases, Washington, Saturation, Fish physiology, Fishkill, Mortality, Morbidity, Dam design, Fish passages, Flow control, Rainbow trout.
Identifiers: *Dissolved gases, *Dam effects, *Gas bubble disease, Steelhead trout.

The nitrogen gas regime in the Columbia River was studied in 1966 and in 1967. Dissolved nitrogen was subject to considerable seasonal fluctuation and varied with flow of water over spillways of dams; it was normal (near 100% saturation) in the fall and winter when no water was spilled, and high (above 135% saturation) in the spring and summer when large volumes of water were spilled. Some saturation levels over large areas were high enough and lasted long enough to be potentially dangerous to salmon (Oncorhynchus sp.) and steelhead trout (Salmo gairdneri). Supersaturation of nitrogen at Priest Rapids Dam lowered the tolerance of juvenile fish to temperature increases, and some showed symptoms of gas bubble disease. Field studies to determine the effects of high levels of dissolved nitrogen on adult salmon and steelhead trout did not provide conclusive results. (LeGore-Washington)
W71-11656

INFLUENCE OF BIOLOGICALLY STABILIZED KRAFT MILL EFFLUENT ON THE FOOD

RELATIONS AND PRODUCTION OF JUVENILE CHINOOK SALMON IN LABORATORY STREAMS,
Oregon State Univ., Corvallis. Dept. of Fisheries.
Wayne Kenneth Seim.
Master of Science Thesis, June, 1970. 55 p, 12 fig, 3 tab, 15 ref. OWRR Project B-004-ORE (5).

Descriptors: *Water pollution effects, *Water pollution treatment, *Pulp wastes, *Chinook salmon, *Growth rates, Water pollution sources, Pulp and paper industry, Fish physiology, Bioassay, Food habits, Industrial wastes, Waste water treatment, Toxicity.
Identifiers: *Kraft mill effluent, Biological effects, Food consumption.

Continuous flow bioassays were conducted using biologically stabilized kraft mill effluent (SKME) to challenge juvenile chinook salmon (Oncorhynchus tschawytscha). Growth as indicated by biomass was the parameter utilized to indicate effect. During spring and fall, a 1.5% SKME concentration caused an apparently direct decrease in salmon biomass. In the summer, salmon production was greater at 4% SKME than at 0% SKME. Summer production was greatest, however, at 1% SKME. It is hypothesized that the greater growth associated with the SKME may be attributable to the increase in numbers of the amphipod (Crangonyx sp.) that served as the main food source for the fish. (LeGore-Washington)
W71-11658

EFFECTS OF BIOLOGICALLY STABILIZED KRAFT MILL EFFLUENTS ON JUVENILE SALMONID GROWTH,
Oregon State Univ., Corvallis. Dept. of Fisheries.
Dennis Leland Borton.
Master of Science Thesis, June 1970. 38 p, 8 fig, 3 tab, 12 ref. OWRR Project B-004-ORE (4).

Descriptors: *Water pollution effects, *Water pollution treatment, *Pulp wastes, *Chinook salmon, *Growth rates, Water pollution sources, Pulp and paper industry, Fish physiology, Bioassay, Food habits, Industrial wastes, Waste water treatment, Toxicity.
Identifiers: *Coho salmon, *Kraft mill effluent, Biological effects, Food consumption.

The effects of sublethal concentrations of stabilized kraft mill effluents (SKME) on the growth and food consumption of juvenile chinook and coho salmon held in aquaria and in exercise channels were studied. No 96 hr median tolerance limit (TL-m) was found for salmon, as more than 50% of the test fish survived in 100% SKME. A decrease in the efficiency of food utilization for growth was related to the reduction of growth rates of salmon exposed to SKME from one mill. There was no effect, however, upon the growth or food consumption of fish in aquaria which could be attributed to SKME from a second mill. No significant effect on the growth and food consumption rates of fish held in exercise channels could be attributed to either SKME at concentrations up to 4.5% by volume. (LeGore-Washington)
W71-11659

THE PRINCIPLE AND OPERATION OF FISH CATCH AND POLLUTION INFORMATION SYSTEM,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 07C.
W71-11660

AN EVALUATION OF SALMONID HATCHERY WASTES,
Federal Water Quality Administration, Portland, Oreg. Northwest Region.
Danforth G. Bodien.
Report, October 1971. 51 p, 8 fig, 8 tab, 6 ref.

Descriptors: *Water pollution sources, *Water pollution control, *Water pollution treatment, *Fish hatcheries, Water pollution effects, Effluents, Fish farming, Fish handling facilities, Water quality, Chemical oxygen demand, Phosphorous compounds, Nitrogen compounds, Ammonia, Coliforms, Biochemical oxygen demand, Environmental effects, Salmonids.
Identifiers: *Fish hatchery wastes, Recommendations.

At present, 114 government fish hatcheries and numerous private hatcheries are operating in the northwestern United States. Most cause no problem, but during low summer river flows, some hatchery wastes create nuisance conditions in receiving waters. The objectives of this study were to quantitate and characterize these wastes, to determine their effects and to recommend control measures where necessary. It is recommended that water pollution control measures be considered for new hatcheries and at existing hatcheries on a priority basis. (LeGore-Washington)
W71-11661

FOOD AND FEEDING OF JUVENILE CHINOOK SALMON IN THE CENTRAL COLUMBIA RIVER IN RELATION TO THERMAL DISCHARGES AND OTHER ENVIRONMENTAL FEATURES,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
C. D. Becker.
BNWL-1528, UC-48, January 1971. 68 p, 11 fig, 9 tab, 51 ref. AEC Contract AT (4501)-1830.

Descriptors: *Thermal stress, *Heated water, *Water temperature, *Thermal pollution, *Water pollution effects, *Chinook salmon, *Columbia River, *Feeding rates, Thermal power, Thermal capacity, Pollutant identification, Temperature, Water pollution sources, Washington, Anadromous fish, Salmonids, Fish behavior, Diets, Food habits, Food abundance, Food webs.
Identifiers: *Hanford works, Oncorhynchus sp., Fish feeding.

The relationship of thermal discharges from Hanford reactors to food and feeding of juvenile chinook salmon (Oncorhynchus tshawytscha) in the central Columbia River, Washington was studied in 1968 and 1969. The primary objectives were to (1) evaluate the food composition and feeding activities of the fish and (2) determine if heated effluents influenced their welfare. Environmental conditions, i.e. seasonal changes in river temperatures and flow volumes, relative to thermal requirements of young chinook, are detailed. Data on food organisms utilized by the fish are presented for 1968 and 1969, whereas analyses for possible thermal effects are based on the more extensive 1969 data. No consistent differences attributable to thermal increments were evident. The lack of detectable effects is apparently due to the fact that the main discharge plumes occur in midriver and the effluents are well mixed before reaching inshore feeding areas. (LeGore-Washington)
W71-11662

PUBLIC HEALTH ASPECTS OF IODINE-129 FROM THE NUCLEAR POWER INDUSTRY,
For primary bibliographic entry see Field 05B.
W71-11666

SITE LOCATION OF DEVELOPMENT.
For primary bibliographic entry see Field 06E.
W71-11667

COEFFICIENTS OF ACCUMULATION OF STRONTIUM-90 IN CERTAIN FISH (RADIOECOLOGICAL STUDY),
Akademiya Nauk Litovskoi SSR, Vilnius. Inst. of Physics and Mathematics; and Institute of the Biology of the Southern Seas, Sevastopol (USSR).
N. F. Dushauskene-Duzh, G. G. Polikarpov, and B. I. Styro.
Available from NTIS. AEC-tr-7024, p 146-149 (Radiobiologiya, Vol 9, No 1, p 113-115 (1969)). 3 fig, 2 tab, 4 ref.

Descriptors: *Lake fisheries, *Strontium radioisotopes, *Freshwater fish, Carp, Perches, Absorption, Water pollution effects, Fallout, Distribution, Lead radioisotopes, Radioactivity technique, Radiochemical analysis.

Uptake of strontium-90 and lead-210 by lake fish was measured. Strontium-90 was separated by the oxalate method, and its decay product yttrium-90 was measured. Lead-210 was separated by ion exchange and its decay product bismuth-210 was measured. The uptake is compared for fish, mollusks, and aquatic plants. The uptake was determined for various fish organs. (Bopp-NSIC)
W71-11668

COEFFICIENTS OF ACCUMULATION OF STRONTIUM-90 AND STRONTIUM IN LAKE PLANTS AND PLANKTON,
Akademiya Nauk Latviiskoi SSR, Riga. Inst. of Biology; and Institute of the Biology of the Southern Seas, Sevastopol (USSR).
Z. K. Kalninya, and S. A. Osipenko.
Available from the National Technical Information Service as AEC-tr-7024, $3.00 in paper copy, $0.95 in microfiche. AEC-tr-7024, p 143-145 (Radiobiologiya, Vol 9, No 1, p 111-112 (1969)). 2 tab, 3 ref.

Descriptors: *Strontium radioisotopes, *Aquatic plants, *Plankton, *Lakes, Chara, Pondweeds, Absorption, Water pollution effects.

Uptake of stable and radioactive strontium by eight species of lake macrophytes and plankton was studied. Stable strontium was determined by flame photometry. It is shown that strontium-90 is in equilibrium with natural strontium in lake plants. (Bopp-NSIC)
W71-11669

INFLUENCE OF SALINITY AND TEMPERATURE ON THE ACCUMULATION OF CESIUM-137 BY AN ESTUARINE CLAM UNDER LABORATORY CONDITIONS,
Bureau of Commercial Fisheries, Beaufort, N.C. Radiobiological Lab.
D. A. Wolfe, and C. B. Coburn.
Health Physics, Vol 18, p 499-505 (1970). 1 fig, 4 tab, 13 ref.

Descriptors: *Clams, *Fallout, Salinity, Temperature, Estuarine environment, Estuarine fisheries, Water pollution effects, Regression analysis, Aquaria.
Identifiers: *Cesium radioisotopes.

Uptake by soft tissue decreased with increasing salinity, but increased with temperature. The proportion of cesium-137 associated with the shell decreased as salinity or temperature increased. The salinity dependence for the whole clam was greater in the present experiments than previously in the field. The data supports the hypothesis of an increasing concentration gradient for cesium-137 in estuarine water as salinity increases. The uptake was described by an asymptotic exponential regression which predicts the concentration factor for cesium-137 at any combination of temperature and salinity. (Bopp-NSIC)
W71-11670

DARIENITA'S DIETARY (BIOENVIRONMENTAL AND RADIOLOGICAL-SAFETY FEASIBILITY STUDIES. ATLANTIC-PACIFIC CANAL),
Battelle Memorial Inst., Columbus, Ohio.
J. A. Duke.
Available from NTIS as BMI-171-31, $3.00 in paper copy, $0.95 in microfiche. BMI-171-31, June 1970. 112 p, 16 tab, 18 ref.

Descriptors: *Nuclear explosions, *Excavation, *Public health, Control, Water pollution control, Radioactivity effects, Radioisotopes, Absorption, Food chains, Strontium radioisotopes, Pacific Ocean, Atlantic Ocean, Canals, Feasibility studies, Tropical regions, Diets, Food habits, Foods.
Identifiers: Cesium radioisotopes, Panama, Columbia.

Dietary studies were made of the natives of Panama and Columbia in order to estimate the radionuclide ingestion by those allowed to return after a selected period of time following nuclear excavation for the proposed interoceanic canal. Weights of ingredients in various food dishes and in the amounts consumed by subjects from various ethnic groups (Caucasian, Choco Indians, Cuna Indian, and Negro) were recorded by investigators who lived for several days with families along Routes 17 and 25. Water added to the food dishes is classified as to source (rain water, well water, or surface water), and chemical analyses of food items are given. (Calories, moisture, protein, fat, carbohydrates, etc, could be computed from the various food types.) A compilation of 361 food dish recipes is appended. (Bopp-NSIC)
W71-11671

PHYSICAL, CHEMICAL AND BIOLOGICAL MEASUREMENTS ON THE WATER OF THE FOSSETTO DELLA CASACCIA, (DETERMINAZIONI FISCHE CHIMICHE E BIOLOGICHE SUL FOSSETO DELLA CASCACCIA),
Comitato Nazionale per l'Energia Nucleare, Rome (Italy). Laboratorio Radioattivita Ambientale.
For primary bibliographic entry see Field 05A.
W71-11672

ECOLOGY AND RESOURCE ECONOMICS: AN INTEGRATION AND APPLICATION OF THEORY TO ENVIRONMENTAL DILEMMAS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 06G.
W71-11673

ENVIRONMENTAL SURVEILLANCE FOR RADIOACTIVITY IN THE VICINITY OF THE CRYSTAL RIVER NUCLEAR POWER PLANT: AN ECOLOGICAL APPROACH.
Florida Univ., Gainsville. Dept. of Environmental Engineering.

Quarterly Progress Report for the Period Ending Jan 31, 1971. 29 p, 5 fig, 9 tab, 12 ref.

Descriptors: *Nuclear wastes, *Food chains, *Marine animals, Aquatic life, Ecosystems, Environmental effects, Sites, Pollution abatement, Tritium, Path of pollutants, On-site data collections, On-site investigations, Air pollution effects, Water pollution effects, Estuarine environment, Salt marshes, Rivers, Gamma rays, Spectrometers, Environmental engineering.
Identifiers: *Radionuclide effluents.

This second report lists the objectives of the preoperational assessment: (1) information about present environmental radioactivity, (2) pathways of critical nuclides to the food chain, (3) radiological survey methods, (4) comparison of present and post-operational environmental radioactivities, and (5) principal ecosystems near the plant site (marine, marshland, and terrestrial). The topics reported include: an extensive sampling program of marine, freshwater, and terrestrial organisms; methods of handling radionuclide effluents; thermoluminescent dosimetry; airborne particulate activity; a total deposition sampler; surveying for environmental tritiated water; evaluation of Spanish Moss as a biological sampler for airborne activity; and gamma ray spectrometry of marine sediments and organisms. (Bopp-NSIC)
W71-11674

THE PROPERTIES OF PERSISTENT OILS AT SEA,
Esso Petroleum Co. Ltd., London (England); and British Petroleum Co. Ltd., Sunbury-on-Thames (England). Research Centre; and Shell Research Ltd., London (England); and Shell International Petroleum Co. Ltd., London (England).
For primary bibliographic entry see Field 05A.
W71-11677

QUANTITATIVE CONTENT OF PHENOL-DESTRUCTIVE BACTERIA IN THE DESNA RIVER WATER IN CONNECTION WITH ITS CONTAMINATION BY PHENOLS,
Joint Publications Research Service, Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-11680

MERCURY POISONING (OR) THE FISH YOU CATCH CAN KILL YOU.
For primary bibliographic entry see Field 05B.
W71-11682

THERMAL POLLUTION,
For primary bibliographic entry see Field 05B.
W71-11683

CHLORINATED HYDROCARBON PESTICIDES IN REPRESENTATIVE FISHES OF SOUTHERN ARIZONA,
California Univ., Berkeley, Bodega Marine Labs., and Arizona State Health Dept., Phoenix, Pesticide Lab.
Donald W. Johnson, and Sam Lew.
Pesticides Monitoring Journal, Vol. 4, No. 2, p 57-61, September 1970. 1 fig, 1 tab, 8 ref.

Descriptors: *DDT, *Dieldrin, *Colorado River Basin, *Fishkill, Arizona, Gas chromatography, Endrin, Carp, Channel catfish, Tilapia, Suckers, Mullet.
Identifiers: *DDE, *Toxaphene, DDD, Metabolites, Strobane, Telone, Liver tissue.

Chlorinated hydrocarbon residues are reported for representative fishes of the lower Colorado River Basin. While most residues were in the p.p.b. range, DDT and metabolites to 187.5 p. p. m. were found. Toxaphene was a common contaminant at levels as great as 172.9 p. p. m. Dieldrin was also present in significant concentrations. DDE was the principal residue found. These findings should prove of value in appraising the effect of the 1969 ban on the use of DDT in Arizona. They appear sufficient to warrant concern for fish and fish-consuming populations. A table is included which shows DDE, DDD, DDT, dieldrin and toxaphene residues by species and tissue. (McCann-Battelle)
W71-11690

THE USE OF ARTIFICIAL SUBSTRATES IN POLLUTION SURVEYS,
Federal Water Quality Administration, Duluth, Minn. Water Quality Lab.
For primary bibliographic entry see Field 05A.
W71-11696

METHODS OF REMOVING NITRATES FROM WATER,
Interagency Agricultural Waste Water Treatment Center, Firebaugh, Calif.
Percy P. St. Amant, and Louis A. Beck.
Journal of Agricultural and Food Chemistry, Vol. 18, No. 5, p 785-788, September-October 1970. 1 tab, 7 ref.

Descriptors: Nitrates, Algae, Dentrification, Filtration, Desalination, Drainage water, Agricultural chemicals, Farm wastes, Waste water treatment, California.

An Interagency Nitrogen Removal Group composed of three agencies, the Federal Water Pollution Control Administration, the U.S. Bureau of Reclamation, and the California department of Water Resources, was formed to attempt to find a method of removing nitrates from agricultural waste waters in California. Three methods of nitrogen removal are being evaluated: pond and filter denitrification, which depend upon bacterial action, and algae stripping. Desalination of tile drainage is also being evaluated. Details and preliminary results of the studies are given. (Little-Battelle)
W71-11698

EXPERIMENTAL ABSORPTION OF DIELDRIN BY CHLORELLA,
Florida Univ., Gainesville. Pesticide Research Lab.
For primary bibliographic entry see Field 05A.
W71-11704

ENTEROPATHOGENIC ESCHERICHIA COLI SEROTYPES FOUND IN SEWAGE LAGOONS (WASTE STABILIZATION PONDS) IN NORTH DAKOTA,
North Dakota State Dept. of Health, Grand Forks. Div. of Labs.
For primary bibliographic entry see Field 05A.
W71-11709

MICROBIAL DISTRIBUTION IN OCEAN WATER RELATIVE TO NUTRIENTS AND FOOD SOURCES,
California Univ., San Diego, La Jolla, Inst. of Marine Resources.
For primary bibliographic entry see Field 05A.
W71-11715

HEAT SHOCKED BACILLUS SUBTILIS SPORES AS AN INDICATOR OF VIRUS DISINFECTION,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 05A.
W71-11717

USE OF AUTOCYTOTOXIC BETA-D-GALACTOSIDES FOR SELECTIVE GROWTH OF SALMONELLA TYPHIMURIUM IN THE PRESENCE OF COLIFORMS,
Food and Drug Directorate, Ottawa (Ontario). Div. of Microbiology.
For primary bibliographic entry see Field 05A.
W71-11720

MORTALITY OF ESTUARINE ANIMALS DUE TO COLD ON THE GEORGIA COAST,
Georgia Univ., Sapelo Island. Marine Inst; and Georgia Univ., Athens. School of Veterinary Medicine.
For primary bibliographic entry see Field 05B.
W71-11721

GANO V HALL (LIVESTOCK DAMAGE RESULTING FROM POLLUTION),
For primary bibliographic entry see Field 06E.
W71-11722

ANALYSIS OF ARSENIC AND SELENIUM IN MARINE RAW MATERIALS,
For primary bibliographic entry see Field 05A.
W71-11726

ANIMAL-SEDIMENT RELATIONS IN SHALLOW WATER BENTHIC COMMUNITIES,
Chicago Univ., Ill. Dept. of Geophysical Sciences.
R. G. Johnson.
Marine Geology, Vol 11, No 2, p 93-104, September 1971. 6 fig, 1 tab, 14 ref. Grant 18050 DFP FWQA.

Descriptors: *Bottom sediments, *Benthos, *Benthic fauna, *Ecology, *Environmental gradient, Habitats, Aquatic habitats, Distribution patterns, Ecological distribution, California, Water pollution effects.
Identifiers: Animal-sediment relationships, *Tomales Bay (Calif.).

Ninety benthic samples were used to study animal-sediment relations in Tomales Bay, California. While most of the benthic species studied were found more often in a particular type of substrate, individuals of such species were occasionally found in other substrates. There is a striking tendency for species occurring outside of their characteristic environment to be associated with the most diverse assemblages of the foreign substrate. Species low in the order of succession are those species that are found more frequently on other substrates. These phenomena are explained in terms of environmental stability. The concepts involved suggest a means of predicting the sequence of faunal changes following the alteration of the substrate. A commonly used index of diversity (Brillouin's equation) was found to be very sensitive to the occurrence of two ubiquitous species. A high correlation was obtained between the number of species and the indes of diversity when the two ubiquitous species were not considered. The benthic environment of Tomales Bay is gradational and faunal variation is correspondingly continuous. Under such circumstances, the animal-sediment and diversity relations described are probably more apparent than in areas where the slope of the environmental gradient is greater. Similar relations would be expected, however, in the deep sea and in continuous stratigraphic sequences in the geologic record.
W71-11732

SATURATION OF WATER WITH CALCIUM CARBONATE AND THE PARTIAL CARBON DIOXIDE PRESSURE IN THE BODIES OF WATER IN THE MOUTH OF THE KUBAN' RIVER,
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Don (USSR).
D. A. Dragunova.
Hydrobiological Journal, Vol 6, No 1, p 50-53, 1970. 1 tab, 16 ref. Translated from Gidrobiologicheskiy zhurnal, Vol 6, No 1, 1970.

Descriptors: *Carbon dioxide, *Calcium carbonate, *Supersaturation, *Aquatic plants, Pondweeds, Submerged plants, Nutrients.
Identifiers: USSR, *Kuban River.

The waters of Kuban' River lagoons, USSR, the bottom of which are covered with vegetation, are supersaturated with CaCO3 because of the disappearance of CO2 used in photosynthesis. CaCO3 does not precipitate at 22- to 49-fold supersaturation and prolonged sample storage. The submersed vegetation of the shallow waters (1 m deep) of Kuban' lagoons is frequently represented by pure cenoses of one to two species. The distribution of the cenoses depends on the depth of the body of water, the nature of its bottom, salinity, the pH, and other factors. In the Kuban' delta, fennel-leaved pondweed is confined mainly to marginal and more saline lagoons with a water chlorinity of 2-5 g/liter. It was found that CO2 is completely depleted in the water layer above chara and water-milfoil growths. The partial CO2 pressure and the conditions of the carbonate system can be regarded as ecological factors determining the distribution of species of submersed vegetation. (Knapp-USGS)
W71-11748

TRACE MATERIALS IN WASTES DISPOSED TO COASTAL WATERS-FATES, MECHANISMS AND ECOLOGICAL GUIDANCE AND CONTROL,
Federal Water Quality Administration, Corvallis, Oreg. National Coastal Research Program.
For primary bibliographic entry see Field 05B.
W71-11793

LONESTAR GAS CO V THOMAS (DAMAGE TO CATTLE FROM BICARBONATED WATER SUPPLY).
For primary bibliographic entry see Field 06E.
W71-11802

TESTING OF OGANOPHOSPHORIC INSECTICIDES FOR ESTABLISHING THE ADMISSIBLE LIMITS IN WATER (TESTAREA INSECTICIDELOR ORGANOFOSFORICE IN VEDEREA STABILIRII LIMITELOR DE ADMISIBILITATE IN APA),
Institutul de Igiena, Cluj (Rumania). Sectia de Igiena Comunala.
N. W. Ghelberg, and H. Straus.
Summaries in French, German, English and Russian. Igiena, Revista a Societatii de Igiena si Sanatate Publica, Vol 18, No 7, p 427-432, 1969. 2 tab, 21 ref.

Descriptors: *Lethal limit, *Water pollution effects, *Organophosphorous pesticides, *Pesticide toxicity, *Organoleptic properties, Bioassay, Agricultural chemicals, Odor, Bioindicators.
Identifiers: Guppies, Malathion, Dimethoate, Ethion.

Three emulsifiable insecticides of the malathione (M), dimetoate (D) and ethion (E) types were investigated. A description is given of the methodology applied for determining the threshold of admissible concentrations in water, according to the use of the various water sources. Results are reported as mg of active substance of the emulsifiable product. Threshold concentrations resulting in odor of aqueous dilutions were 0.22 mg M/l, 0.35 mg D/l, and 0.6 mg E/l. Influence upon the receptor's chemical characters as modifiers of the oxygen regime (CBO sub 5 greater than or equal to 5 mg/l water) were determined to be less than 5 mg M/l, and less than or equal to 1.0 mg of D and E/l. One tenth of the average limit tolerance values in 48 hr for guppies (Lebistes reticulatus) were 0.5 mg M/l, 3.0 mg D/l, and 0.028 mg E/l. In experiments on mice, the three insecticides were found to have a cumulative property. (LeGore-Washington)
W71-11808

DATA CONCERNING THE INFLUENCE OF EMULSIONED MALATHIONE ON CERTAIN OF THE PHYSICOCHEMICAL FEATURES OF WATER AND AQUATIC ORGANISMS (DATE CU PRIVIRE LA INFLUENTA MALATHIONULUI EMULSIONATE ASUPRA UNOR CARACTERISTICA FIZICO-CHIMICE ALE APEI SI ASUPRA UNOR ORGANISME ACVATICE),
Institutul de Igiena, Cluj (Rumania).
N. W. Ghelberg, Lucia Costin, and Susana Nagy.
Summaries in French, German, English and Russian. Igiena, Revista a Societatii de Igiena si Sanatate Publica, Vol 17, No 2, p 80-90, 1968. 4 fig, 3 tab, 18 ref.

Descriptors: *Pesticides, *Water pollution effects, *Pesticide toxicity, *Public health, *Organoleptic properties, *Organophosphorous pesticides, Agricultural chemicals, Lethal limit, Bioassay, Environmental sanitation.
Identifiers: *Malathion, *Guppies, Rana sp., Labistes sp., Xiphophorous sp.

The maximum permissible values of emulsioned Malathion (37% active product) in different natural water basins were determined. The determinations were concerned with the influence of Malathion on organoleptic characters, on the sanitary regimen (20 day periods in waters of medium hardness and soft waters), and its toxic effect on aquatic organisms (tadpoles, Rana esculenta; guppies, Lebistes reticulatus; and the fish, Xiphophorus sp.). The following limit values are expressed in mg of pure malathion/liter of water: 0.1 with respect to organoleptic alteration, 5.0 with respect to the influence exercised on the sanitary regimen, and 0.7 with respect to toxic effects (TLm 48 h:10 — 1/10 TLm-48) on guppies in water of medium hardness, and 0.5 in soft waters. (LeGore-Washington)
W71-11809

TAXONOMIC GUIDES TO ARCTIC ZOOPLANKTON (I): AMPHIPODS OF THE CENTRAL ARCTIC - EUPHAUSIIDS OF THE ARCTIC BASIN AND PERIPHERAL SEAS,
University of Southern California, Los Angeles. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05A.
W71-11822

OHIO OIL CO V ELLIOT (ASSESSMENT OF DAMAGES TO LIVESTOCK PERMANENTLY AND TEMPORARILY INJURED BY SALT WATER POLLUTION FROM OIL WELLS).
For primary bibliographic entry see Field 06E.
W71-11824

MAN'S IMPACT ON THE GLOBAL ENVIRONMENT - ASSESSMENT AND RECOMMENDATIONS FOR ACTION.
Massachusetts Inst. of Tech, Cambridge.
For primary bibliographic entry see Field 05B.
W71-11825

OIL POLLUTION OF THE OCEAN,
Woods Hole Oceanographic Institution, Woods Hole, Mass.
For primary bibliographic entry see Field 05A.
W71-11843

NITROGEN AND CARBON DISTRIBUTION IN SEDIMENT CORES OF SELECTED WISCONSIN LAKES,
Wisconsin Dept of Natural Resources, Madison; and Wisconsin Univ., Madison, Dept of Soil Science.
For primary bibliographic entry see Field 05A.
W71-11845

LEVELS OF PRODUCTION IN THE PELAGIC ENVIRONMENT OF THE STRAIT OF GEORGIA, BRITISH COLUMBIA: A REVIEW,
Fisheries Research Board of Canada, Nanaimo (British Columbia). Biological Station.
For primary bibliographic entry see Field 05A.
W71-11850

THE ISOLATION AND OCCURRENCE OF HYALOCHLORELLA MARINA,
California Univ. Berkeley. Microbiology Group; and California Univ; Berkeley. Dept. of Botany.
For primary bibliographic entry see Field 05A.
W71-11851

MARINE ALGAE OF THE SOLOMON ISLANDS,
Adelaide Univ. (Australia). Dept. of Botany.
For primary bibliographic entry see Field 05A.
W71-11854

COMPARISON OF THE POLLUTED HOOGHLY ESTUARY WITH THE UNPOLLUTED MATLAH ESTUARY, INDIA,
Central Inland Fisheries Research Inst., Barrackpore (India).
A. K. Basu, B. B. Ghosh, and R. N. Pal.
Journal Water Pollution Control Federation, Vol 42, No 10, p 1771-1781, October 1970. 7 fig, 1 tab, 17 ref.

Descriptors: *Industrial wastes, *Water quality, *Dissolved oxygen, *Phytoplankton, Estuaries, Water temperature, Turbidity, Photosynthesis, Hydrogen ion concentration, Nitrite, Ammonia, Salinity, Aquatic algae, Zooplankton, Biochemical oxygen demand, Copepods.
Identifiers: Coscinodiscus, Nitzschia, Oscillatoria, Pleurosigma, Nauplii, Lamellibranch, Spirogyra, Eudorina, Cyclops, Keratella, Asplanchna, Lithodesmium, Harpesticoids, Noctiluca, Cen-

tropyxis, Biddulphia, Chaetoceros, Thalassisthrix, India.

A short preliminary study to assess the general physicochemical and biological conditions of the Hooghly estuary, into which a large quantity of industrial pollutants is being discharged from different factories, was attempted, and a comparison has been drawn with the conditions of the unpolluted Matlah estuary. The results revealed the following points: (1) The general condition of the Hooghly with respect to dissolved oxygen, oxygen consumption value, and temperature was inferior to that of the Matlah. (2) Turbidity of the Hooghly was generally higher than that of the Matlah. (3) pH, nitrite N, and free ammonia values were more or less the same in the midstream of both the estuaries, although a low pH value of 4.3 was observed near a discharge point in the Hooghly. (4) The quantum of plankton, which serves as a fish food, was less in the Hooghly than the Matlah. (5) Some of the physicochemical conditions, mainly temperature, turbidity, pH, nitrite nitrogen, free ammonia, DO, and OC, near a few discharge outlets in the Hooghly estuary indicated conditions unfavorable for fish and fisheries or at least tending to make the adjoining area uninhabitable. (Mortland-Battelle)
W71-11876

MERCURY IN THE ENVIRONMENT.
For primary bibliographic entry see Field 05B.
W71-11878

GASTROINTESTINAL BACTERIA OF CERTAIN ANTARCTIC BIRDS AND MAMMALS,
Department of Supply, Melbourne (Australia). Antarctic Div.; and Melbourne Univ., (Australia). School of Microbiology.
For primary bibliographic entry see Field 05B.
W71-11879

THERMAL EFFECTS AND NUCLEAR POWER STATIONS IN THE U.S.A.,
Argonne National Lab., Ill. Center for Environmental Studies; and Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
D. Miller, J. V. Tokar, and R. E. Nakatani.
Available from the National Technical Information Service as CONF-700810-30, $3.00 in paper copy, $0.95 in microfiche. Report No IAEA-SM-146/30 (No date). 14 p, 1 tab, 21 ref.

Descriptors: *Thermal pollution, *Nuclear powerplants, *Water quality control, *Biodegradation, Water utilization, Fish, Algae, Model studies, Bioassay, Aquatic life, Cooling water, Sites.

Of 94 nuclear power plants in the U.S., 60.6 percent are cooled by once-through systems in which the cooling water is returned directly to a natural water source. These thermal discharges undoubtedly modify the biological communities that are exposed. Although general effects are known, there are insufficient data available at present to permit effective evaluation of plant sites and discharge details on the biotic communities. It is therefore necessary that studies be undertaken relative to power plant siting and operation to ensure compliance with water quality standards, to define mixing zones, to predict temperature distributions in receiving water, to assess biological perturbations, to design intake and outfall structures to minimize biological damage, to control nuisance growths of plants and algae, and to determine sublethal effects of temperature on aquatic life. (Little-Battelle)
W71-11881

ENVIRONMENTAL POLLUTION,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
For primary bibliographic entry see Field 05B.
W71-11882

FURTHER STUDIES ON LONG TERM PRESERVATION OF MARINE BACTERIA,
Torry Research Station, Aberdeen (Scotland).
For primary bibliographic entry see Field 05A.
W71-11884

OBSERVATIONS ON CERTAIN ENVIRONMENTAL FEATURES AT THE DONA PAULA POINT IN MARMUGAO BAY, GOA,
National Inst. of Oceanography Pangim (India).
For primary bibliographic entry see Field 05A.
W71-11886

DISTRIBUTION AND ABUNDANCE OF TUBIFICID (OLIGOCHAETA) SPECIES IN TORONTO HARBOUR, LAKE ONTARIO,
Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 05A.
W71-11887

THE EFFECT OF NICKEL ON A MARINE BACTERIUM, ARTHROBACTER MARINUS SP.NOV.,
New Hampshire, Univ., Durham. Dept. of Microbiology.
A. B. Corbet, C. Wirsen, and G. E. Jones.
Journal of General Microbiology, Vol. 62, Pt. 2, p 159-169, August 1970. 1 fig, 2 tab, 47 ref.

Descriptors: *Marine bacteria, *Fecundity, *Heavy metals, Bacteria, Cultures, Toxicity, Resistance.
Identifiers: *Nickel, *Arthrobacter marinus, Nickel chloride, Morphology.

During the course of a study of the tolerances of marine and freshwater bacteria to nickel ions, it was noted that Arthrobacter marinus sp.nov. exhibited unusual morphological responses, an unbalanced growth situation, resulting in large, plasmolysed spheroplasts (megalomorphs). The effect of increasing nickel concentrations was gradual. Under the cultural conditions used, a slight effect was noted on size in 1 x 10-4M-NiCl2, but in 4 x 10-4M-NiCl2 the cells formed megalomorphs attaining a size of 10 to 15 microns. Cell division did not occur in 5 x 10-4M-nickel. The lag phase of the culture increased from about 3 h. without added nickel to more than 70 h. at 4 x 10-4M-nickel. Concurrently, the maximum population decreased as the nickel concentration was increased. The classification of the marine bacterium is described and the organism is designated as A. marinus sp.nov. (McCann-Battelle)
W71-11890

PRESERVATION OF VIABLE FLEXIBACTERIA AT LOW TEMPERATURES,
Scripps Institute of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05A.
W71-11896

MEASURING THE BIOLOGICAL EFFECTS OF HEATED DISCHARGES,
La Salle Coll., Philadelphia, Pa.
Charles B. Wurtz, and John S. Penny.
Proceedings of the American Power Conference, Vol 31, p 344-349, 1969. 5 ref.

Descriptors: *Thermal pollution, *Statistical analysis, *Data processing, Lake Erie, Diatoms, Susquehanna River (Pennsylvania), Water temperature, Florida, Schuylkill River (Pennsylvania), Invertebrates, Sampling, Bioindicators.
Identifiers: Lake St. Croix, Macroinvertebrates, Data interpretation.

Thermal effects in an equatic habitat represent but one of a multiplicity of environmental factors. Biological studies directed toward the effect of a heated discharge must include satisfactory measurements of the biological structure of the habitat in relation to all major environmental factors. Any of several sampling and data-processing methods can be used to secure adequate information. The particular method employed should be the one where maximum information is secured at minimum cost, which is to say, by the least time-consuming method. In the authors' opinion, the most satisfactory approach to biological studies under most conditions is a study based on the total number of macroinvertebrate species forming the resident community. The collected data should be processed by standard statistical methods and the results expressed in terms of these statistics. Such terms are meaningful descriptive terms and can be used for direct comparison with results from other surveys. (Mortland-Battelle)
W71-11899

ANALYSIS OF p,p'-DDT AND p,p'-DDE PESTICIDE RESIDUES BY NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY,
Food and Drug Administration, Perrine, Wis. Div. of Pesticide Chemistry and Toxicology.
For primary bibliographic entry see Field 05A.
W71-11907

LAKE VOLTA--A PROGRESS REPORT,
Makerere Univ. Coll., Kampala (Uganda). Dept. of Zoology.
For primary bibliographic entry see Field 05A.
W71-11909

MAY BE INESCAPABLE--MEDDLESOME MERCURY.
For primary bibliographic entry see Field 05B.
W71-11910

HYPNODINIUM-LIKE ALGAL BLOOMS IN GEORGIA LAKES,
Georgia Water Quality Control Board, Atlanta; and Georgia State Univ., Atlanta. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W71-11914

FISH AS POTENTIAL VECTORS OF HUMAN BACTERIAL DISEASES,
Fort Detrick, Frederick, Md. Medical Sciences Labs.
Werner A. Janssen.
Available from the National Technical Information Service as AD-714 452, $3.00 in paper copy, $0.95 in microfiche. 1970. 7 p, 40 ref.

Descriptors: Diseases, Vectors (Biology), Pathogenic bacteria, Pseudomonas, Fish, Oysters, Crabs, Clostridium, Salmonella, Shigella, E. coli, Bioindicators, Bullheads, White perch, Mycobacterium.
Identifiers: Aeromonas, Staphylococcus, Pasteurella, Leptospira.

The similarities between pathogens which infect humans and those found in fish suggests that fish may act as passive or active hosts for pathogens which infect man. Review of the relatively few studies conducted in the past and the author's own experience demonstrate the feasibility of this thesis. Because of the increased use of fish for food, the contamination of water, especially with human wastes, and the contact between man and the aquatic environment, research on this subject should be expanded. (Little-Battelle)
W71-11919

STUDIES ON THE BIOLOGICAL EFFECTS OF THERMAL DISCHARGES FROM NUCLEAR REACTORS TO THE COLUMBIA RIVER AT HANFORD,
Battelle Memorial Inst., Richland, Washington. Pacific Northwest Labs.
William L. Templeton, and Charles C. Coutant.
Available from the National Technical Information Service as BNWL-SA-3465, $3.00 in paper copy, $0.95 in microfiche. Report Nos. BNWL-SA-3465; IAEA/SM-146/33; CONF-700810-38. (I.A.E.A.

Symposium on Environmental Aspects of Nuclear Power Stations, United Nations Headquarters, New York), August 10-14, 1970. 37 p, 14 fig, 15 ref.

Descriptors: *Thermal pollution, *Columbia River, *Nuclear powerplants, Washington, Water temperature, Toxicity, Fisheries, Chinook salmon, Sockeye salmon, Lampreys, Rainbow trout, Tracking techniques, Migration patterns, Census, Spawning, Fish diseases, Mathematical models.
Identifiers: Coho salmon, Steelhead, Shad, White sturgeon, Infrared imagery, Sonic tags, Chrondococcus columnaris.

Laboratory and field studies were conducted to develop temperature criteria for several fish species and thus determine potential effects of heated reactor discharges. These studies indicate that there is no demonstrable effect on the fishery resource. Consideration of the data in the light of the seasonal thermal cycle of the river temperature and in relation to the seasonal life stage of salmon and trout present in the river indicates that the river temperatures could be higher during the periods of late fall, winter and spring without causing significant damage to the development of young salmon. During the summer months, the temperature of the Columbia River has always been above the optimum for salmonids. Although a temperature of 60 F is often recommended as an upper limit for adult salmon in route to their spawning grounds, recorded temperatures for the Columbia show that 60 F has always been exceeded during the summer months. However, the problem of evaluating and assessing the total ecological effect of small increments of heat added to rivers, lakes, estuaries and coastal waters defies a direct definitive answer because of gaps in knowledge about the effects of subtle perturbations of temperature in other ecological parameters. (Mortland-Battelle)
W71-11924

A CHECKLIST OF PLANKTONIC DIATOMS AND DINOFLAGELLATES FROM THE MOZAMBIQUE CHANNEL,
Museum National d'Historie Naturelle, Paris (France).
For primary bibliographic entry see Field 02I.
W71-11926

DISTRIBUTION OF EARLY DEVELOPMENTAL STAGES OF PINK SHRIMP, PENAEUS DUORARUM, IN FLORIDA WATERS,
Miami University, Fla. Rosenstiel School of Marine and Atmospheric Sciences.
For primary bibliographic entry see Field 02L.
W71-11927

WATER TEMPERATURE AS A SOURCE OF VARIATION IN SPECIFIC ACTIVITY OF BRAIN ACETYLCHOLINESTERASE OF BLUEGILLS,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
James W. Hogan.
Bulletin of Environmental Contamination and Toxicology, Vol 5, No 4, p 347-353, July/August 1970. 2 fig, 1 tab, 17 ref.

Descriptors: *Pesticides, *Water temperature, *Water pollution effects, *Sunfishes, Aquatic environment, Arkansas, Iowa, Aquatic animals, Analytical techniques, Bioassay, Animal physiology.
Identifiers: Acetylcholinesterase, Enzyme preparation.

Since certain pesticides affect the activity of brain acetylcholinesterase, the effects of these pesticides can potentially be evaluated by determining the changes in the activity. To validate the method, the effects of parameters, such as fluctuations in ambient water temperature and sex of the animal, were determined by comparing the water temperature with AChE activity of sexually mature bluegills which were held in a natural environment. 93 female and 141 male bluegills were analyzed over a 14-month period. The results indicate that sex is not an important variable in the use of brain AChE to assess pesticide pollution, at least when using bluegills. However, AChE activity was found to vary directly with environmental water temperature. It was concluded that changes in ambient water temperature may be a source of considerable error in the use of bluegill brain AChE for the biological assessment of pollution by anticholinesterase agents. (Mortland-Battelle)
W71-11938

JOINT O.E.C.D./T.N.O. CONFERENCE ON OCCURRENCE AND SIGNIFICANCE OF PESTICIDE RESIDUES IN THE ENVIRONMENT HELVOIRT, NETHERLANDS, 15TH-18TH SEPTEMBER 1969.
Organization for Economic Co-Operation and Development, Paris (France).
For primary bibliographic entry see Field 05A.
W71-11941

SCIENTIFIC FUNDAMENTALS OF THE EUTROPHICATION OF LAKES AND FLOWING WATERS, WITH PARTICULAR REFERENCE TO NITROGEN AND PHOSPHORUS AS FACTORS IN EUTROPHICATION,
Organization for Economic Co-Operation and Development Paris (France).
R. A. Vollenweider.
OECD Report, September 1970. 159 p.

Descriptors: *Eutrophication, *Nitrogen, *Phosphorus, *Bibliography, *Nutrients, Potassium, Magnesium, Sulfates, Trace elements, Lakes, Detergents, Waste water (Pollution), Fertilizers, Water pollution sources, Farm waste, Nitrates, Biomass, Dissolved oxygen, Scenedesmus, Chlorophyll, Bacteria, Phytoplankton, Industrial wastes, Water quality, Aquatic productivity.
Identifiers: River Thames, Lake Constance (Germany, Austria, Switzerland), Switzerland, W. Germany, Lake Lugano (Italy/Switzerland), Italy, Lake of Zurich (Switzerland), Austria, Lake Leman (France, Switzerland), France, Lake Varese (Italy), Nitzschia, Lake Mairut (Egypt), Egypt, Lake Erken (Sweden), Lake Gorvaln (Sweden), Sweden, Esrom So Fureso (Denmark), Denmark, Lago Maggiore (Italey), Lago di Mergozzo (Italy), Lake of Kummerow (Germany), Lake Tahoe (Nevada), Lago di Como (Italy), Lago di Piano (Italy), Lago di Ghirla (Italy), Lago di Ganna (Italy), Lago di Monate (Italy), Lago d'Orta (Italy), Brienzersee (Switzerland), Thunersee (Switzerland), Walensee (Switzerland), Sempachersee (Switzerland), Hallwilersee (Switzerland), Pfaffikersee (Switzerland), Feldsee (Germany), Titisee (Germany), Schluchsee (Germany), Worthersee (Austria), Langsee (Austria), Mondsee (Austria), Ossiachersee (Austria), Millstattersee (Austria), Klopeinersee (Austria), Lunzersee (Austria), Attersee (Austria), Traunsee (Austria), Ransaren (Sweden), Kultsjon (Sweden).

The existing literature on eutrophication and the current status of work concerned with the part played by phosphorus and nitrogen in the process of eutrophication were studied with the following results: (1) The eutrophication of waters is a problem of increasing urgency in the more highly developed countries. (2) Nitrogen and phosphorus appear to be most important among the nutrients responsible for eutrophication. (3) There are a number of propositions concerning the importance of phosphorus and nitrogen which may be used to arrive at yardsticks for defining critical concentrations and maximum permissible loads. (4) The substances contributing to the load derive partly from diffuse sources throughout the geographical area and partly from point sources that can readily be located. (5) In Europe diffuse sources are likely to account on the average for more than 50 percent of the total nitrogen loading whereas most of the phosphorus comes from point sources. (6) The present state of eutrophication of many waters could be improved by near-complete elimination of all point sources. (7) The techniques required to apply control measures based on the elimination of nitrogen and phosphorus from sewage have now reached a fairly advanced state of development. There are three problem areas which require in-depth investigation: (a) maximum permissible phosphorus and nitrogen loads in relation to associated morphological hydrological, hydrochemical and bioclimatological factors; (b) quantitative aspects of nutrient sources; (c) the role of trace elements and organic factors. (See also W71-11943) (McCann-Battelle)
W71-11942

SCIENTIFIC FUNDAMENTALS OF THE EUTROPHICATION OF LAKES AND FLOWING WATERS, WITH PARTICULAR REFERENCE TO NITROGEN AND PHOSPHORUS AS FACTORS IN EUTROPHICATION--ANNEX,
Organization for Economic Co-Operation and Development, Paris (France).
R. A. Vollenweider.
OECD Report, September 1970. 61 p.

Descriptors: *Eutrophication, *Nitrogen, *Phosphorus, *Bibliography, *Nutrients, Potassium, Magnesium, Sulfates, Trace elements, Lakes, Detergents, Waste water (Pollution), Fertilizers, Water pollution sources, Farm waste, Nitrates, Biomass, Dissolved oxygen, Scenedesmus, Chlorophyll, Bacteria, Phytoplankton, Industrial wastes, Water quality, Aquatic productivity.
Identifiers: River Thames, Lake Constance (Germany, Austria, Switzerland), Switzerland, W. Germany, Lake Lugano (Italy/Switzerland), Italy, Lake of Zurich (Switzerland), Austria, Lake Leman (France, Switzerland), France, Lake Varese (Italy), Nitzschia, Lake Mairut (Egypt), Egypt, Lake Erken (Sweden), Lake Gorvaln (Sweden), Sweden, Esrom So Fureso (Denmark), Denmark, Lago Maggiore (Italy), Lago di Mergozzo (Italy), Lake of Kummerow (Germany), Lake Tahoe (Nevada), Lago di Como (Italy), Lago di Piano (Italy), Lago di Ghirla (Italy), Lago di Ganna (Italy), Lago di Monate (Italy), Lago d'Orta (Italy), Brienzersee (Switzerland), Thunersee (Switzerland), Walensee (Switzerland), Sempachersee (Switzerland), Hallwilersee (Switzerland), Pfaffikersee (Switzerland), Feldsee (Germany), Titisee (Germany), Schluchsee (Germany), Worthersee (Austria), Langsee (Austria), Mondsee (Austria), Ossiachersee (Austria), Millstattersee (Austria), Klopeinersee (Austria), Lunzersee (Austria), Attersee (Austria), Traunsee (Austria), Ransaren (Sweden), Kultsjon (Sweden).

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cal and bioclimatological factors; (b) quantitative aspects of nutrient sources; (c) the role of trace elements and organic factors. (See also W71-11942) (McCann-Battelle)
W71-11943

ANNUAL PROGRESS REPORT JULY 1, 1968 - JUNE 30, 1969, FRESHWATER VERTEBRATE AND INVERTEBRATE ECOLOGY OF AMCHITKA ISLAND,
Utah State Univ., Logan.
John M. Neubold, and William T. Helm.
Battelle Memorial Institute, Columbus Laboratories, Contract Report no. BMI-171-127, April 1970, 50 p. 6 fig, 32 tab.

Descriptors: *Aquatic productivity, Alaska, Biomass, Dredging, Stickleback, Nets, Sampling, Carbon, Detritus, Salmon, Clams, Oligochaetes, Nematodes, Water temperature, Hydrogen ion concentration, Conductivity, Caddisflies, Larvae, Mayflies, Copepods, *Fish population, Stoneflies, Diptera, Gastropods, Mollusks, Daphnia, Amphipoda, Sculpins, *Food habits, Crustaceans, Benthic fauna.
Identifiers: Amchitka Island (Alaska), Dolly Varden, Chironomids, Ostracods, Corothium spinicola, Gnorimosthperoma lutea, Flatworms, Corixidae, Trichoptera, Coleptera, Tripulidae, Simuliidae, Anthomyiidae, Collambola, Sternorrhyncha, Bibionidae, Mycetophylidae, Coelopidae, Ichneumonidae, Pelecypoda, Araneida, Mysids, Psychodidae, Acarima, Ostracods, Arachnids, Cottus alenticus, Syrphidae, Ceratopogonidae.

Effort was directed toward determining the direction of energy flow in four intensive study sites on Amchitka Island (Alaska). Estimates are given for stream primary production, detritus and dissolved organic content (carbon content), invertebrate populations, and fish populations. Essentially, the data collected during the year coroborated the data collected during fiscal year 1968, that is, that the food-energy economics base of the lakes and streams under investigation are primarily detritus based, judging from the food ingested by the Dolly Varden and the threespine stickleback. Some variation, however, was experienced in the quality of food ingested by both the Dolly Varden and threespine stickleback. This quality varied with the season. During the summer portions of the year, some herbivorous insects were found in significant quantities in the fishes' guts. These included caddisflies and mayflies. In addition, the Dolly Varden did take threespine stickleback in the wintertime. The data collected, when converted to biomass production, yielded models that gave confidence that estimates of energy flow would be reliable. (Mortland-Battelle)
W71-11946

SEWERAGE PROJECT NUMBER WPC-ILL.-754 SUBMITTED BY NORTH SHORE SANITARY DISTRICT, WAUKEGAN, ILLINOIS.
Environmental Protection Agency, Chicago, Ill. Water Quality Office.

Available from the National Technical Information Service as PB-198 692-D, $3.00 in paper copy, $0.95 in microfiche. EPA draft environmental impact statement, Chicago, April 22, 1971, 38p.

Descriptors: *Environmental effects, *Sewage treatment, *Water pollution sources, Storm runoff, *Storm drains, Economics, Tertiary treatment.
Identifiers: *Environmental surveys, *Illinois, Construction, Lake Michigan, Storm sewers, *Environmental impact statements, *Lake County, Illinois, North Shore Sanitary District.

This is a Draft Environmental Impact Statement for a sewerage project involving a construction grant application that has been submitted by the North Shore Sanitary District (NSSD). When completed, the project will provide 48 million gallons per day (MGD) of sewage treatment capacity to serve the eastern portion of Lake County, Illinois. After weighing all alternatives, this statement reflects the view that the over-all project is sound, but that desirable modifications would include a smaller installation at Clavey Road (to offset the proximity of the plant to residential neighborhoods). The incorporation of some advanced waste treatment processes, a covered retention basin of reduced size, and a supplemental plant to be developed at a Des Plaines River location. Other adverse impacts will result from likely discharge of stormwater overflows to Lake Michigan in the northern portion of the project. It is recommended that these discharges be eliminated.
W71-11948

EUTROPHICATION OF NORTHEASTERN OHIO LAKES: I INTRODUCTION, MORPHOMETRY, AND CERTAIN PHYSICO-CHEMICAL DATA OF DOLLAR LAKE,
Kent State Univ., Ohio. Inst. of Limnology.
G. D. Cooke, and Robert L. Kennedy.
The Ohio Journal of Sciences, Vol. 70, No. 3, p 150-161, May 1970. 7 fig, 1 tab, 14 ref.

Descriptors: *Eutrophication, *Lakes, *Water pollution effects, Ohio, Nutrients, Water pollution sources, Dissolved oxygen, Lake morphology, Aquatic algae, Mosses, Water temperature, Water chemistry, Chlorophyll, Hypsometric analysis, Hypolimnion, Epilimnion, Cyanophyta, Dinoflogellates, Seasonal, Zooplankton, Phytoplankton.
Identifiers: Dollar Lake (Ohio), Sphagnum, Aphanizomenon flos-aquae, Ceratium, Oscillatoria, Transparency.

Three northeastern Ohio lakes (East Twin, West Twin, and Dollar) are being studied to compare lakes in different stages of eutrophication within the same area and to evolve long-term before-and-after comparisons. This is the first of a series of articles to be prepared from these studies. Basic eutrophication data on Dollar Lake are presented. Because it is most strongly influenced by human habitation and is the smallest of lakes, it was selected as the model lake from which comparative observations can be drawn. Dollar Lake has a volume of 86,400 cubic meters and an area of 22,212 square meters. The average depth is 3.89 meters, the maximum depth is 7.5 meters. Maximum width of the lake is 140 meters, the maximum length 215 meters. Except for brief periods in spring and fall, deep waters are depleted of dissolved oxygen. Secchi Disc transparency is frequently below one meter. Massive blooms of algae are often observed. The lake stratifies thermally in April, circulates in October, and restratifies in December after ice formation. Spring circulation occurs in March. Dollar Lake is a dimictic, second-class eutrophic lake. (Mortland-Battelle)
W71-11949

PESTICIDE RESIDUES IN CHANNEL CATFISH FROM NEBRASKA,
Nebraska Game and Parks Commission, Lincoln. Research Div.
For primary bibliographic entry see Field 05A.
W71-11950

MERCURY COMPOUNDS REDUCE PHOTOSYNTHESIS BY PLANKTON,
Florida State Univ., Tallahassee. Dept. of Oceanography.
Robert C. Harriss, and David B. White.
Science, Vol. 170, No. 3959, p 736-737, November 13, 1970. 2 fig, 6 ref.

Descriptors: *Fungicides, *Diatoms, *Phytoplankton, Toxicity, Puerto Rico, Florida, Water pollution effects.
Identifiers: *Mercury, Lake Jackson (Florida), Nitzschia delicatissima, Merismopedia, Navicula, Crucigenia, Staurastrum, Ankistrodesmus.

Concentrations of organomercurial fungicides as low as 0.1 part per billion in water reduced photosynthesis and growth in laboratory cultures of one species of marine diatom and several natural phytoplankton communities from Florida lakes. The acute toxicity of mercury compounds to phytoplankton is dependent on the chemical nature of the mercury compound and on cell concentrations. At least some marine and freshwater phytoplankton species are sensitive to much lower concentrations of mercurial compounds than are fish. Concentrations well below the proposed quality standards (5 p.p.b. for drinking water) can have detrimental effects on phytoplankton. Therefore, long-term effects of mercury pollution below concentrations of 1 p.p.b. must be determined and discharge of organomercurial compounds into natural waters should be stopped as soon as possible. (Mortland-Battelle)
W71-11952

A SCREENING TECHNIQUE FOR ESTIMATING COPPER TOXICITY TO ESTUARINE PHYTOPLANKTON,
Federal Water Quality Administration, West Kingston, R.I. National Marine Water Quality Lab.
S. J. Erickson, N. Lackie, and T. E. Maloney.
Journal Water Pollution Control Federation (Res. Supple.), Vol. 42, No. 8, Part 2, p R270-R278, August 1970. 1 fig, 5 tab, 17 ref.

Descriptors: *Phytoplankton, *Copper, *Toxicity, Salinity, Hydrogen-ion concentration, Diatoms, Dinoflagellates, Rhode Island, Seawater, Cultures, Chlorella, Estuaries, Industrial wastes.
Identifiers: Nitrilotriacetate.

A screening technique for estimating copper toxicity to estuarine phytoplankton was devised as a means to establish the working range in metals toxicity bioassays. The procedure is simple, direct and economical. It allows the simultaneous measurement of ten concentrations of metal to six species of phytoplankton representing four taxonomic groups. The technique is limited in precision because cells are not maintained in the exponential phase of growth, thus reducing sensitivity. Copper concentrations in steps of 50 mmicrogram/l identify only the approximate toxic concentrations. The results indicate that copper is highly toxic to estuarine phytoplankton at low concentrations. Copper entering an estuary with wastewater, especially under lowered conditions of salinity and pH, could influence the composition of the phytoplankton population quantitatively and qualitatively. The phytoplankton community could be altered in favor of the more tolerant but less desirable organisms. (Mortland-Battelle)
W71-11955

TRISODIUM NITRILOTRIACETATE AND ALGAE,
A. E. Christie.
Water and Sewage Works, Vol 117, No 2, p 58-59, February 1970. 4 tab, 6 ref.

Descriptors: *Algae, *Detergents, *Toxicity, *Activated sludge, *Nutrients, Nitrogen, Water pollution effects, Water pollution sources.
Identifiers: *Chlorella pyrenoidosa, *Trisodium nitrilotriacetate.

Relationships between trisodium nitrilotriacetate, a potential detergent builder, and the alga chlorella pyrenoidosa with respect to toxicity and as a nitrogen source were examined. Preliminary experiments on the role of NTANa3 as a source of nitrogen for algae were carried out by measuring growth in a mineral media. Equivalent quantities of nitrogen were added either as NTANa3 or sodium nitrate, both with and without the addition of a small quantity of raw sewage. Preliminary testing of NTANa3 toxicity to algae was accomplished by adding the compound to week-old cultures grown in a complete mineral medium. Examination of NTANa3 as a nitrogen source for algae was also investigated by culturing chlorella in the filtered supernatants of aliquots of activated sludge which had received various concentrations of NTANa3. The results indicate that NTANa3 at concentra-

tions up to 275 mg/l is not toxic to the test organism and can act as a source of nitrogen for algal growth. No significant differences were found in algal responses in the supernatants of the activated sludge except in those related to the highest concentrations of the NTANa3. The highest concentration did not reduce the algal growth potential of the chemical. Since carbon is generally the nutrient limiting bacterial action in sewage treatment plants, the feasibility of biodegradable organic materials as detergent builders which contain neither nitrogen nor phosphorus should be thoroughly considered. (Little-Battelle)
W71-11972

FERN LAKE MINERAL METABOLISM PROGRAM,
Washington Univ., Seattle. Coll. of Fisheries.
L. R. Donaldson.
Available from the National Technical Information Service as RLO-2225-T-7-3, $3.00 in paper copy, $0.95 in microfiche. Atomic Energy Commission Contract report RLO-2225-T-7-3, June 16, 1970. 21 p.

Descriptors: *Trophic level, *Nutrients, *Cyanophyta, *Rainbow trout, *Phosphates, Ecosystem, Zooplankton, Sockeye salmon, Metabolism, Aquatic productivity, Washington, Midges.
Identifiers: *Fern Lake (Washington), Ammonium phosphate.

The Fern Lake program is a cooperative effort by the U.S. Atomic Energy Commission, the University of Washington and the State of Washington Department of Game to investigate the fundamental processes governing productivity in an aquatic ecosystem. The major objective of this long-range study is to relate the nutrient status of the lake to the trophic levels and to determine the effect on the production of fish. Fertilization was initiated in mid-June and was continued at weekly intervals on a 10-week period. The slow response of the primary producers was significant and the latter dominance of a blue-green algae has consequences that resulted in some undesirable effects, particularly to the zooplankton. Insect emergence responded favorably to the enrichment, especially in the spring of 1970, when emergence records for the ooze area were the highest ever recorded for the lake. The rainbow-steelhead trout hybrids planted in the lake this year, although showing an abnormally poor growth during the fall and winter because of the low zooplankton population, produced phenomenal growth as the spring midge emerged. The growth data were almost twice that of any other year. In May of 1970, sockeye salmon were planted in the lake. This species is a plankton-feeder and its behavioral characteristics will be compared with those of the steelhead trout. (McCann-Battelle)
W71-11978

AQUATIC ASPECTS IN CHRONIC AND ACUTE CONTAMINATION SITUATIONS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
A. Preston, and D. F. Jefferies.
In: Environmental Contamination by Radioactive Materials, Proceedings of Joint Seminar held Mar 24-28, 1969, Vienna, Austria: International Atomic Energy Agency (STI/PUB/226), Paper SM-117/44, p 183-211, 1969. 29 p, 10 fig, 13 tab, 89 ref.

Descriptors: *Path of pollutants, *Radioisotopes, *Surface waters, *Bottom sediments, *Sea water, Water pollution sources, Fallout, Radioactive wastes, Radioactive waste disposal, Data collections, Reviews, Water pollution effects, Fish, Aquatic habitats, Environmental effects, Monitoring.

The present state of knowledge of the behavior of radionuclides in the aquatic environment and the potential consequences for public health are reviewed. Data are given illustrating the average concentration in water, sediment and biota of both naturally-occurring radionuclides and those derived from nuclear weapon testing. The behavior of radionuclides deliberately introduced into the aquatic environment under controlled disposal conditions is examined. Distributions of radionuclides in water, sediment and biota in the vicinity of waste disposal sites are illustrated as both a function of time and space. Reconcentration factors are derived and combined with radionuclide toxicity to provide a ranking order for hazard assessment. Data and experience gained from controlled disposal operations are used for an assessment of the consequences of a large release in a shallow coastal water environment. (See also W71-11979) (Knapp-USGS)
W71-11980

REDUCED FLOWS AND THE FUTURE ECOLOGY OF THE SAN FRANCISCO BAY-DELTA SYSTEM,
California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 05B.
W71-12030

DATA ON THE BIOLOGICAL EFFECT OF SMALL AMOUNTS OF NATURAL URANIUM IN WATER,
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
Yu. V. Novikov, and T. V. Yudina.
Hygiene and Sanitation (Russian Translation), Vol 35, No 1, January 1970, p 63-71, 5 fig, 3 tab, 17 ref.

Descriptors: *Laboratory tests, *Poisons, Analytical techniques, Colorimetry, Water pollution effects, Nuclear wastes, Rodents, Phosphorus, Enzymes, Ureas, Public health.
Identifiers: *Uranium, Rats, Rabbits, Kidney, Liver.

Although much work has been done to determine the effects of uranium on animals in doses larger than 0.1 mg/kg of body weight, almost none of the experimentation has dealt with dosages of less than 0.1 mg/kg body weight. This was considered to represent a critical gap since uranium contamination of a water supply would produce long term contamination at low levels. 24 female rabbits were subjected to peroral doses of uranyl nitrate of .02 mg/kg (1 maximum perimissible concentration-MPC) 0.2 mg/kg (10 MPC), and 1 mg/kg (50 MPC) for 12 months. The rats received uranium VI in water in doses of .05 mg/l (.08 MPC), 0.6 mg/l (1 MPC), 6 mg/l (10 MPC) and 60 mg/l (100 MPC) for 11 months. The levels of urea, creatinine, and chlorides in the blood were monitored as indices of the functional state of the kidneys, as well as the activity of tissue enzymes, alkaline phosphatase and inorganic phosphorus in the blood serum, and nucleic acids in certain organs. Three conclusions were obtained from the preceding investigations: (1) functional state of the kidneys was not preceptibly impaired; (2) protracted enteral-uptake of 1 mg/l of uranium in rabbits and 60 mg/l uranium in rats inhibited nucleic acid metabolism in the liver and kidneys; and (3) 6 and 60 mg/l concentrations caused increased serum alkaline phosphatase activity after 11 months, identifying enzyme system changes as the first link in the reaction to protracted uranium uptake. (Lowry-Texas)
W71-12042

BIOLOGICAL EFFECT AND SAFE CONCENTRATION OF SELENIUM IN DRINKING WATER,
Institute of General and Municipal Hygiene, Moscow (USSR).
I. P. Pletnikova.
Hygiene and Sanitation, (Russian Translation), Vol 35, No 2, February 1970, p 176-180.

Descriptors: Laboratory tests, *Toxicity, Metals, Odor, Water quality control, Analytical techniques, Rodents, Poisons, Phosphorus, Biochemical oxygen demand, Nitrification, Public health, Water treatment, Water pollution effects.
Identifiers: *Selenium, Liver, Kidneys, Immunology, Rats, Rabbits.

Short term experiments were performed on white mice, albino rats, guinea pigs, and rabbits to determine the effects of selenium in the water. The comparative toxicities of sodium and potassium selenites and selenates were investigated by detailed short term experiments on mice, followed by statistical processing of the results. Medium term experiments, indicating that selenium does have a general toxic effect, prompted two long-term experimental series. Series I on 32 rabbits for 7 1/2 months, and series II on 16 albino rats for 6 months. Parameters studied included phosphorus, protein, carbohydrate, and vitamin metabolism, enzymatic immunological reactions, the excretory function of the liver and kidneys, and blood and tissue morphology. The animals were dosed with sodium selenite perorally in concentrations of .005, .0005, and .00005 mg/kg body weight. Resultant data showed that a dose of .00005 mg/kg (equivalent to .001mg/l as selenium) may be regarded as being free of toxic effects. .0005 mg/kg (corresponding to .01 mg/l selenium) was shown to be the liminal dose, both with respect to toxicological and organoleptic (odor level) criteria. Therefore, sanitary-toxicological considerations dictate a recommendation of .001 mg/l as the limiting value of selenium in any water source. (Lowry-Texas)
W71-12047

THE ACUTE TOXICITY TO RAINBOW TROUT OF FLUCTUATING CONCENTRATIONS AND MIXTURES OF AMMONIA, PHENOL AND ZINC,
Water Pollution Research Lab., Stevenage (England).
V. M. Brown, B. A. Tiller, and D. H. M. Jordan.
Journal of Fish Biology, Vol 1, p 1-9, 1969. 5 fig, 5 tab, 22 ref.

Descriptors: Water pollution effects, *Rainbow trout, *Toxicity, *Phenol, *Ammonia, Lethal limit, *Trout, Fish.
Identifiers: *Zinc, Fluctuating concentrations, Fish toxicity.

Investigators experimentally examined the survivability of hatchery reared fingerling rainbow trout in fluctuating concentrations of poisons and in constant concentrations of mixtures of poisons. Tests were conducted in Perspex aquaria using 40 l of solution, using 10 or 15 fish in each batch. Fish were immersed in solutions of ammonia zinc, or ammonia and zinc at calculated values of 0.5 and 1.5 of the 48 hour LC50. Fluctions were obtained by transfering fish from one level of toxicity to the other at intervals of 1,2,3, or 4 hours. Control fish were handled in a similar manner. Mixtures of ammonia, phenol and zinc, in varying proportions at levels of toxicity calculated by the method of Litchfield and Wilcoxon (1949) from 0.5 to 2.54 of the 48 hour LC50. Concentrations of ammonia, similar regardless of whether the fish were immersed in constant concentration or in concentrations fluctuating plus or minus 50%, as long as the period of fluctuation did not exceed the period within which imeversible change occurs. Tests validated the method of Litchfield and Wilcoxon for calculating toxicity for fractional toxicities except when zinc is the dominant poison. With zinc predominating (greater than 70%) some antagonistic effect is apparent. (Goessling-Texas)
W71-12054

SELECTED INFORMATION ABOUT REPORTED RESEARCH ON THE SUBJECT OF POLLUTION DUE TO STORM WATER AND OVERFLOWS FROM COMBINED SEWAGE,
Nova Scotia Technical Coll., Halifax. Atlantic Industrial Research Inst.
For primary bibliographic entry see Field 05D.

W71-12057

THE INFLUENCE OF SUSPENDED MICROSCOPIC SUBSTANCES ON THE METABOLIC ACTIVITIES OF MICROORGANISMS RESPONSIBLE FOR BIOLOGICAL ENRICHMENT OF WATER,
Ohio State Univ., Columbus. Water Resources Center.
Robert M. Pfister.
Available from the National Technical Information Service as PB-202 581, $3.00 in paper copy, $0.95 in microfiche. Water Resources Center Final Report, 1971. 125 p, 22 fig, 10 tab, 19 photos, 100 ref. OWRR A-006-OHIO (4).

Descriptors: *Suspended load, *Metabolism, *Microorganisms, *Chlorinated hydrocarbon pesticides, Water analysis, Aldrin, Lake Erie, Bacteria, Electron microscopy, Flocculation, Aquatic microorganisms, Dieldrin, Ecology, Water pollution, Dissolved oxygen, Cytological studies, Adsorption, Sediments, Colloids, Pseudomonas, Spectrophotometry, Carbohydrates, Environmental effects, Activated carbon, Growth rates, Analytical techniques, Pesticides, Water purification, Eutrophication.
Identifiers: *Microscopic substances, *Biological enrichment, Growth characteristics, Flocculated bacteria, Microparticulates.

Microbial ecology and water pollution, particulate suspended colloidal material in the water column of Lake Erie has been investigated on a physical, chemical, and biological basis. Various inorganic and detrital fractions have been characterized using differential and gradient centrifugation in conjunction with electron microscopy. The particulates are comprised of substances of varying densities and sizes; fractions exert an influence on growth and metabolism of microorganisms. Various pesticides are associated with these fractions, such as the chlorinated hydrocarbons, endrin, aldrin, heptachlor, and lindane. The significance of the involvement of such pesticides in the microecology is great since it is now known that microbial cell yields, DNA, RNA, and protein patterns of synthesis are affected. These facts strongly suggest that presence of chlorinated hydrocarbons in water seriously alter microbial metabolism and in turn affect higher life forms in ways presently not understood. Experiments on removal of aldrin from lake water using flocculent bacteria showed that floc forming bacteria adsorbed and concentrated aldrin from a colloidal dispersion. The settling of the bacterial flocs removed the chemical from the water phase. (Jones-Wisconsin)
W71-12064

SORPTION OF SOLUBLE PHOSPHATES BY FRESHWATER SEDIMENTS IN THE HURON RIVER BASIN, MICHIGAN,
Eastern Michigan Univ., Ypsilanti. Center for Aquatic Biology.
James Lincoln.
Available from the National Technical Information Service as PB-202 582, $3.00 in paper copy, $0.95 in microfiche. Project completion report, February 1971. 29 p, 3 fig, 5 tab, 24 ref. OWRR A-045-MICH (1).

Descriptors: *Phosphates, *Sorption, *Sediments, Inorganic compounds, Eutrophication, Physicochemical properties, Water pollution effects, Adsorption, Water pollution sources, Sewage treatment, Water pollution control, Particle size, On-site investigations, Michigan.
Identifiers: Phosphate-sediment relationships, Inorganic phosphate, Organic phosphate, Huron River (Mich).

Analyses of sediment and water samples collected down stream from phosphate sources disclosed a removal of phosphates by both sediments and suspended inorganic materials. The phosphates are recycled by bacteria, aquatic plants, and stream degradation. The discharge of sewage and industrial refuse in the lower Huron River increased phosphate content in both water and sediments. The development of algal slimes was paralleled by a reduction in the diversity of aquatic organisms, and in some instances climaxed in the formation of mud-ooze sediments that support only limited benthos. Fixation of phosphorus by ashed sediments is the only method removing phosphates from waste waters. (Wilde-Wisconsin)
W71-12067

THE EFFECT OF CARBON ON ALGAL GROWTH--ITS RELATIONSHIP TO EUTROPHICATION,
Utah State Univ., Logan. Utah Water Research Lab.
Joel C. Goldman, Donald B. Porcella, E. Joe Middlebrooks, and Danie F. Toerien.
College of Engineering, Occasional Paper 6, April 1971. 56 p, 7 fig, 7 tab, 242 ref.

Descriptors: *Carbon, *Algae, *Eutrophication, *Limiting factors, Photosynthesis, Carbon cycle, Absorption, Decomposing organic matter, Alkalinity, Hydrogen ion concentration, Nutrients, Aquatic environment, Carbon dioxide.
Identifiers: Chemistry of inorganic carbon, Carbon transformation, Carbon sources, Organic carbon, Carbon utilization.

Availability of inorganic and organic carbon for photosynthesis of algal cells depends upon ionic composition of the medium and the population of the aquatic system. In sewage lagoons, eutrophic lakes, or laboratory cultures containing an excess of nutrients, carbon can be the factor limiting the growth of algal mass. However, in most lakes inorganic sources, atmosphere, and bacterial degradation provide an adequate supply of carbon for the amount of available light, nitrogen, and phosphorus. In terms of practical technology, the control of algal growth is usually related to the content of phosphorus. (Wilde-Wisconsin)
W71-12068

DEFECATION RATE OF THREE TUBIFICID OLIGOCHAETES FOUND IN THE SEDIMENT OF TORONTO HARBOUR, ONTARIO,
Toronto Univ. (Ontario). Dept. of Zoology.
A. G. Appleby, and R. O. Brinkhurst.
Journal Fisheries Research Board of Canada, Vol 27, No 11, p 1971-1982, 1971. 9 fig, 3 tab, 8 ref. FWPCA 16010ECQ.

Descriptors: *Tubificids, *Oligochaetes, *Sediments, Temperature, Weight, Worms.
Identifiers: *Defecation rate, Toronto Harbour (Canada), Peloscolex multisetosus, Tubifex tubifex, Limnodrilus hoffmeisteri.

In studying worm association and interaction with sediment and associated microflora in Toronto Harbor, defecation rate of three tubificid species, Tubifex tubifex, Peloscolex multisetosus, and Limnodrilus hoffmeisteri were investigated in relation to temperature. Nature of the sediment may be important in determining defecation rate, as worms may feed less actively on rich organic than sandy sediments. Temperature affects the defecation rate, the effect differing from species to species. Based on defecation rate and weight change at each experimental temperature, 14C is an optimum temperature range for Peloscolex multisetosus, 18C for Tubifex tubifex, and greater than 20C for Limnodrilus hoffmeisteri. Probably due to lowered activity prior to observed mortality, P multisetosus showed downward trends of defecation rate with time. Upward trends in defecation rate by L hoffmeisteri may indicate continuing acclimation to experimental conditions beyond their 10- to 14-day duration, or a need to process increasing amounts of less nutritious mud because of selective feeding on richer fractions at the beginning of the assay period. Estimates of defecation rates of tubificid populations in the field were made from data on relative abundance and distribution of species in Toronto Harbor. (Jones-Wisconsin)
W71-12069

THE RELATION OF ACETYLENE REDUCTIO TO HETEROCYST FREQUENCY IN BLUE GREEN ALGAE,
Westfield Coll., London (England). Dept. c Botany.
William J. Jewell, and S. A. Kulasooriya.
Journal of Experimental Botany, Vol 21, No 69, 874-880, 1970. 1 fig, 3 tab, 13 ref.

Descriptors: *Cyanophyta, *Algae, *Nitrogen fixa tion, Enzymes, Bacteria, Spores, Nitrogen Metabolism.
Identifiers: *Acetylene reduction, *Heterocysts Anabaena cylindrica, Anabaenopsis, Acetylen test, Cylindrospermum licheneforme Mastigocladus laminosus.

If nitrogen-fixing enzyme system is located exclu sively in the heterocysts, and, if acetylene-reduc tion technique gives a quantitative measure of thi activity, it may be possible to estimate nitrogen fix ation from the frequency of heterocysts and the acetylene reduction capacity of heterocysts. This study attempted to determine variation, with cul ture age, of acetylene-reduction activity and heterocyst frequency in five species of blue-green algae using bacteria-free cultures of Anabaena cylindrica (nonsporing), Anabaena cylindrica (sporing), Anabaenopsis, Cylindrospermum licheniforme, and Mastigocladus laminosus. Varia tion and average heterocyst frequency are sum marized except for Cylindrospermum licheniforme which grew with tightly intertwined filaments so that it was impossible to count a large number of samples. The heterocyst frequency varied between 2.5% to 12.3% of total cells; and the acetylene reduction activity varied 2.6-fold (average). Consistency of the values of the coefficient of acetylene reduction indirectly supports the initial assumption that site of nitrogen fixation is the heterocyst. Estimates of nitrogen fixation rates by blue-green algae may be made by in situ heterocyst count and acetylene reduction measurements. (Jones-Wisconsin)
W71-12070

TOLERANCE OF BLUE-GREEN ALGAE TO PESTICIDES,
Indian Agricultural Research Inst., New Delhi. Div of Microbiology.
G. S. Venkataraman, and B. Rajyalakshmi.
Current Science, Vol 40, No 6, p 143-144, 1971. 1 tab, 8 ref.

Descriptors: *Cyanophyta, *Pesticides, *Fertiliza tion, Nutrients, Algae, Rice, Nitrogen, Nitrogen fixation, 2-4-D, Dalapon, Herbicides, Crop produc tion.
Identifiers: *Tolerance levels, Tolypothrix tenuis Aulosira fertilissima, Anacystis nidulans, Cerason Diathene, Propazine, Cotoron, Diuron, Linuron.

Influence of algalization on high-yielding rice varie ties under high levels of fertilization has prompted a study on tolerance of nitrogen-fixing blue-green algae to some pesticides. Twenty-eight strains of blue-green algae belonging to five different genera were tested against varying concentrations of eight pesticides. The difference in growth of treated and untreated cultures was used to assess the effect of pesticides. A large percentage of the strains tested showed a high tolerance limit to all pesticdes applied many times more than the recommended doses of application. Tolypothrix tenuis, a powerful nitrogen-fixer, widely used in inoculation trials, grew in high concentrations of all pesticides, except Diuron. The related Aulosira fertilissima, while tolerating high levels of Cerasan, Diathene, 2,4-D and Dalapon, was sensitive to the substituted urea compounds like Cotoron, Diuron, and Linuron as well as to the triazine herbicide, Propazine. The non-nitrogen-fixing Anacystis nidulans tolerated high concentrations of all the pesticides examined. The present investigation indicates that these algae can be used in presence of pesticides and are able to function in presence of high levels of nitrogenous fertilizers. (Jones-Wisconsin)
W71-12071

ROLE OF PHOSPHORUS IN EUTROPHICATION,
Wisconsin Univ., Madison. Water Chemistry Program.
G. Fred Lee.
Presented at the Symposium of American Chemical Society, Division of Water, Air and Waste Chemistry, Los Angeles, California, April 1970.

Descriptors: *Phosphorus, *Eutrophication, Fertilization, Aquatic plants, Mathematical models, Self-purification, Algae, Great Lakes, Nutrients, Sediments, Lake Michigan, Water pollution sources, Water pollution control, Trophic levels, Phosphates, Detergents, Bioassay, Analytical techniques, Forecasting, Silica.
Identifiers: Flushing, Green Bay (Wis), Nitrilotriacetic acid, Algal assay procedures, Algal growth, In-lake nutrient control.

Significance of phosphorus as the key element in excessive fertilization of natural waters is presented and its role on plant growth in lakes. Tools to assess phosphorus and other elements fertilizing natural waters are mathematical models, enzymatic and tissue assay procedures. Appraisal of nutrient status of lakes can be made during February and March of each year in temperate lakes to show the potential problems and steps initiated to control excessive discharge of nutrients. Sediments serve as a sink for phosphorus with the net flux of phosphorus from lake water to sediments. Contemplated nutrient removal projects should be associated with some laboratory leaching tests on lake sediments and results compared with lake recovery rate upon nutrient reduction. Development of models for aqueous environmental chemistry of aquatic nutrients in natural waters is essential to improve the predictability of relationships between the flux of aquatic plant nutrients and growth of algae and other aquatic plants. In replacing phosphates in detergents, the primary problem is the procedure used to evaluate the replacement. (Jones-Wisconsin)
W71-12072

A CASE STUDY OF MICROORGANIC CONTAMINANTS IN RIVER WATER,
Carnegie-Mellon Univ., Pittsburgh, Pa. Mellon Institute; and Virginia State Water Control Board, Richmond.
Robert A. Baker, and Robert Jennings.
Presented at National Meeting, American Chemical Society, Houston, Texas, February 1970. Water and Sewage Works, Vol 117, No 2, p 412-416, 1970. 5 fig, 3 tab, 16 ref.

Descriptors: *Monitoring, *Water pollution, *Potable water, Odor, Taste, Organic matter, Phenols, Chlorine, Analytical techniques, Virginia, North Carolina.
Identifiers: Smith River (Va and NC), Spray (NC), Philpott Reservoir (Va), Contaminant transport.

This study attempted to trace the source of contaminants importing taste and odor to water of the Smith River (Va and NC). A combination of gas-liquid chromatography with flame-ionization detection and freeze concentration provided results indicating that a correlation of the sensory quality of water and its microorganic contents is feasible. Calculations and chromatograms suggested that two phenolic substances, thymol and guaiacol, may be responsible for poor sensory quality of water. (Wilde-Wisconsin)
W71-12073

THE CONTRIBUTION OF HIGHER PLANTS IN THE PRODUCTIVITY OF DRAINAGE-FREE WATER BASINS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
Milan Straskraba.
Mitteilungen Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol 14, p 212-230, 1968. 1 fig, 4 tab, 104 ref.

Descriptors: *Primary productivity, *Aquatic plants, *Energy transfer, Floating plants, Rooted aquatic plants, Submerged plants, Biochemistry, Plant physiology, Phytoplankton, Sea water, Fresh water, Analysis.
Identifiers: *Aquatic macrophytes, *Energy contribution, Caloric values, Phragmites, Glyceria, Carex, Typha, Scirpus, Juncus, Sphagnum.

This paper reports proximate analyses and calorific values of several members of the three groups of aquatic macrophytes: emergent, submergent, and foliage-floating plants. The energy contribution of aquatic macrophytes to the pelagic region is estimated at one-tenth of their caloric values. The contribution of macrophytes to the primary production, as determined by analysis of 15 water basins, varies between 2% and 5% of the total phytoplanktonic production. (Wilde-Wisconsin)
W71-12074

NITROGEN AND CARBON DISTRIBUTION IN SEDIMENT CORES OF SELECTED WISCONSIN LAKES,
Wisconsin Dept. of Natural Resources, Madison; and Wisconsin Univ., Madison. Dept. of Soil Science.
John G. Konrad, Dennis R. Keeney, Gordon Chesters, and Kuan-Lin Chen.
Journal Water Pollution Control Federation, Vol 42, No 2, p 2094-2101, 1970. 5 tab, 26 ref.

Descriptors: *Nitrogen, *Carbon, *Distribution, *Sediments, *Dredging, Cores, Wisconsin, Lakes, Sampling, Eutrophication, Hardness (Water), Nutrients, Calcium carbonate, Ammonia, Interfaces, Sludge, Marl, Soil erosion, Test procedures, Clays, Nitrites, Sedimentation rates, Denitrification.
Identifiers: Lake Mendota (Wis), Lac LaBelle (Wis), Trout Lake (Wis), Lake Minocqua (Wis), Clastics sedimentation.

For dredging to be successful in decreasing nitrogen as a means of reversing eutrophication, nutrients from the newly exposed sediment should be significantly lower than that of the removed sediment. Objectives of this work were evaluation of the application sediment nitrogen distribution data to reflect cultural eutrophication, and feasibility of decreasing the nitrogen status of Wisconsin lakes by sediment dredging. Two southern Wisconsin hardwater lakes, LaBelle and Mendota, and two northeastern Wisconsin softwater lakes, Trout and Minocqua, were investigated. Sediment cores were taken in March, while the lakes were still ice-covered. Samples for total, organic, and inorganic carbon, total nitrogen, and exchangeable and fixed ammonium-nitrogen analyses were prepared. Distribution of organic carbon in each of the profiles paralleled total nitrogen closely, thereby providing relatively constant organic carbon-total nitrogen ratios. It is difficult to obtain striking evidence of cultural eutrophication by use of carbon and nitrogen distribution data. Total and available nitrogen levels were quite high in all profiles, and available nitrogen tended to increase with depth, indicating that dredging operations would not be suitable for reversing the nitrogen status of these or similar lakes. (Jones-Wisconsin)
W71-12076

A SURVEY OF THE BOTTOM FAUNA IN LAKES OF THE OKANAGAN VALLEY, BRITISH COLUMBIA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
Ole A. Seather.
Fisheries Research Board of Canada (MS) Technical Report No 196 (Undated). 31 p, 3 fig, 7 tab, 15 ref.

Descriptors: *Lakes, *Benthic fauna, *Trophic levels, *Surveys, Biological communities, Bioindicators, Lake morphology, Ecological distribution, Midges, Water pollution effects, Oligochaetes, Diptera, Algae, Insects.
Identifiers: Trophic communities, Okanagan Lake (Canada), Skaha Lake (Canada), Osoyoos Lake (Canada), Deformed chironomids.

Bottom fauna were studied to determine pollution effects in three large lakes in Okanagan Basin, British Columbia. A comparison with earlier data indicates Lake Okanagan is not only polluted in certain areas, but bottom fauna of whole lake has changed. There has been significant increase in total numbers of bottom organisms for stations shallower than 50 meters and significant increase in total numbers of chironomids, oligochaetes, Pisidium and perhaps others. Most striking change is in percentage distribution between groups. Oligochaetes have increased from 15% of macrobenthos to 50% to 60% of fauna, suggestive, together with deformed chironomids occurrence, of insecticide pollution. The lake as a whole is still oligotrophic although not ultraoligotrophic. The few Skaha Lake stations were insufficient for detailed characterization; it has probably been moderately eutrophic a long time and a dramatic change in bottom fauna may have occurred quite recently. Osoyoos Lake's northern and central basins are, according to composition of bottom fauna, moderately and strongly eutrophic, respectively. In Okanagan and Skaha Lakes chironomids with deformed mouth-parts and thickened body walls were found. Deformed chironomids may be useful in detecting some forms of pollution. (Jones-Wisconsin)
W71-12077

CHEMISTRY OF SURFACE SEDIMENTS OF SIXTEEN LAKES IN THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
G. J. Brunskill, D. Povoledo, B. W. Graham, and M. P. Stainton.
Journal Fisheries Research Board of Canada, Vol 25, No 2, p 277-294, 1971. 3 fig, 12 tab, 73 ref.

Descriptors: *Chemical properties, *Sediments, *Lakes, Soils, Bedrock, Profundal zone, Glacial drift, Weathering, Organic matter, Fine-textured soils, Mineralogy, Ions, Particle size, Aluminum, Silts, Clays, Phosphorus, Iron, Carbon, Nitrogen, Hydrolysis, Rainfall, Hydrogen ion concentration, Diatoms, Leaching, Oxidation-reduction potential, Carbon dioxide, Conductivity, Evaporation, Calcium, Quartz, Kaolinite, Illite, Montmorillonite, Drainage, Meromixis, Silica.
Identifiers: *Experimental Lakes Area, *Northwestern Ontario, Canada, Equisetu, Plagioclase, Ilmenite, Chlorite, Magnetite, Biotite, K-feldspar, Muscovite.

Descriptive chemical data on bedrock, soils, and profundal lake sediments of the Experimental Lakes Area are given and compared with similar data from better known lakes of the world. The acid granodiorite bedrock and the plagioclase-K-feldspar-quartz glacial drift of the region exhibit low rates of chemical weathering. Secondary (weathered) minerals in the soils of the drainage area and lake sediments are (in rough order of abundance) illite, chlorite, kaolinite, interstratified clay minerals of uncertain composition, and montmorillonite. Most of the sand and silt was brought into the area from the northeast, north, and northwest during periods of Pleistocene glaciation. The major minerals of the lake sediments are quartz, plagioclase, K-feldspar, illite, chlorite, kaolinite. Loss on ignition for the lake sediment samples varies from 18% to 62% dry weight, organic carbon from 8% to 34% dry weight, total nitrogen from 0.9% to 3.5% dry weight, and total phosphorus from 0.1% to 0.3% dry weight. These surficial lake sediment samples are 88% to 96% water, and concentrations of major ions in sediment interstitial water are 1.5 to 5 times the concentration of major ions in lake water. (Jones-Wisconsin)
W71-12078

ZOOBENTHOS OF FIFTEEN LAKES IN THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO,

Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
Andrew L. Hamilton.

Journal Fisheries Research Board of Canada, Vol 28, No 2, p 257-263, 1971. 1 fig, 5 tab, 26 ref.

Descriptors: *Benthic fauna, *Lakes, Ecological distribution, Geomorphology, Amphipoda, Numerical analysis, Dissolved oxygen, Temperature, Invertebrates, Standing crop, Diptera, Thermal stratification, Dominant organisms, Indicators, Oligochaetes, Biological communities, Profundal zone, Precambrian eras, Sediments, Ultraviolet radiation, Meromixis, Chemical stratification, Hypolimnion, Habitats, Amphipoda.
Identifiers: *Experimental Lakes Area, *Northwestern Ontario (Canada), Pontoporeia affinis, Pisidium conventus, Chaoborinae, Sphaeriidae, Morphometry, Sublittoral.

Main features of benthic communities in lakes within the Experimental Lakes Area are defined and correlated with environmental parameters. The sublittoral and profundal zones of 15 lakes, representing a variety of morphometric types with varying depths and surface areas, were studied with regard to zoobenthos composition. A close relationship existed between the zoobenthos and the morphometric features of the individual lakes. The benthic faunas were very diverse; the major physical and chemical features that contribute to this diversity appear to be depth, temperature, and the dissolved oxygen level. The last two characteristics, especially of the bottom water, that are largely a function of lake morphometry, are probably primary factors limiting individual species distribution. The amphipod Pontoporeia affinis, and the sphaeriid Pisidium conventus, were the dominant species in the larger deeper lakes, whereas species of Chironomidae and Chaoborinae were the dominant forms in all lakes with mean depths of less than 10 meters. Relations that, in ELA lakes, apparently exist between the benthic faunas and the physical and chemical lake conditions will probably have some application to other small Canadian Shield lakes. (Jones-Wisconsin)
W71-12080

VERTICAL DISTRIBUTION AND SEASONAL ABUNDANCE OF ZOOPLANKTON IN TWO SHALLOW LAKES OF THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO,

Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. W. Schindler, and Bengt Noven.

Journal Fisheries Research Board of Canada, Vol 28, No 2, p 245-256, 1971. 12 fig, 4 tab, 34 ref.

Descriptors: *Seasonal distribution, *Distribution patterns, *Zooplankton, *Shallow water, Lakes, Diurnal distribution, Rotifers, Crustaceans, Biomass, Daphnia, Copepods, Dystrophy, Ologiotrophy, Eutrophication, Spatial distribution, Productivity, Aquatic populations, Varieties, Temperature, Density.
Identifiers: *Experimental Lakes Area, *Northwestern Ontario (Canada), Canadian Shield, Nauplius, Mesotrophic, Polytrophic.

Natural variations in zooplankton biomass, production, and species composition must be known to interpret changes appearing with eutrophication. Thus studies were made of life histories, behavior patterns, and trophic relations for important zooplankton species in Experimental Lakes Area (ELA), noting seasonal variations in zooplankton abundance in two lakes. Species seasonal dynamics are discussed relative to their patterns in Canadian Shield and other localities. Day and night vertical distributions were sampled on two dates in summer; three species of rotifers migrated diurnally in lake 122, but no evidence of diurnal movement was found in lake 132. In both lakes all crustaceans studied migrated vertically somewhat, except for nauplius larvae and Leptodora kindtii; vertical distribution patterns on the two dates differed little. Average zooplankton biomass was calculated and compared with that of other studies. Average zooplankton biomass during ice-free season was 72 and 156 mg/cm dry weight for lakes 122 and 132, respectively. Diaptomus minutus, Cyclops bicuspidatus thomasi, Holopedium gibberum, and Bosmina longirostris were the dominant species in both lakes. Ecological tolerances of rotifer species agreed well with those found for Swedish waters. (Jones-Wisconsin)
W71-12081

INTERACTIONS BETWEEN SOME TUBIFICID OLIGOCHAETES AND BACTERIA FOUND IN THE SEDIMENTS OF TORONTO HARBOUR, ONTARIO,

Toronto Univ. (Ontario). Dept. of Zoology.
M. Wavre, and R. O. Brinkhurst.

Journal Fisheries Research Board of Canada, Vol 28, No 3, p 335-341, 1971. 1 fig, 7 tab, 20 ref.

Descriptors: *Tubificids, *Oligochaetes, *Bacteria, *Diets, Sediments, Mud, Worms.
Identifiers: *Toronto Harbour (Canada), Aeromonas, Limnodrilus hoffmeisteri, Tubifex tubifex, Feces, Flavobacterium, Pseudomonas fluorescens, Bacillus mycoides, Bacillus cereus, Micrococcus, Peloscolex multisetosus, Chromobacterium.

The degree of destruction of bacteria on passage through the gut of tubificid oligochaetes was measured by a simple, relatively quantitative, technique and also the relative abundance of the different bacteria in feces compared to worm's food. Three tubificid species and seven heterotrophic aerobic bacteria were identified from Toronto Harbor sediment. Nutrient agar medium was used to establish relative abundance of identifiable bacteria in mud and in feces voided after 18 hours. Relative abundance of bacteria was reduced by about 72% and bacterial variety was reduced in feces compared to those in mud. After approximately one week's starvation, only one type of bacteria was detected in worm feces and guts, whereas all seven were ingested at one time or another. Each tubificid species had a different surviving bacterium, but, sometimes in all three worm species, Aeromonas was seen to replace the surviving species. Results suggest that the fraction of bacterial flora investigated forms part of the tubificid diet. Explanation of survival of morphologically unspecialized sediment-feeding worm species in close proximity to each other may rest in differences between detritus feeders relative to their use of bacteria. (Jones-Wisconsin)
W71-12082

THE CRUSTACEAN PLANKTON COMMUNITIES OF LAKES,

Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
Kazimierz Patalas.

Transactions of the American Microscopical Society, Vol 90, No 1, p 118, 1971. 3 ref.

Descriptors: *Marine animals, *Crustaceans, *Plankton, *Lakes, Biological communities, Arctic, Great Lakes, Colorado, Lake Huron, Temperature, Lake Superior, Eutrophication, Daphnia, Trophic levels, Spatial distribution, Dominant organisms.
Identifiers: North America, Canadian Shield, British Columbia, Calanoids, Cyclopoids, Great Bear Lake (NW Territories), Great Slave Lake (NW Territories), Lake Winnipeg (Manitoba), Ontario, MacKenzie Delta (NW Territories), Poland.

Summer plankton communities of seven Great Lakes and 257 smaller North American lakes from Arctic Islands through Canadian Shield and British Columbia to the Colorado Mountains and Plains, contained 62 pelagic crustacean species (29 cladocerans, 25 calanoids, 8 cyclopoids). Species number in communities of Great Lakes was positively correlated with depth and epilimnic water temperature. There were only two to four dominant species, number being unrelated to total number of species. From north to south, calanoids tended to diminish and cyclopoids and cladocerans increased. Based on percentage species in common plus the same dominant species, certain lakes had high community similarity. Number of species in smaller lakes of a single lake region increased proportionally to length of the growing season. About 30 seems to be an asymptotic number of pelagic crustacean species in any one region. Very low and very high dissolved solids concentrations limited the species number; with increasing eutrophication, changes at various levels of zooplankton organization could be seen. In the range from oligotrophic to eutrophic lakes, these subspecies can be arranged as follows: Bosmina longispina, Bosmina gibbera, Bosmina crassicornis, Bosmina kessleri, Bosmina coregoni, and Bosmina thersites. (Jones-Wisconsin)
W71-12083

WATER QUALITY IN RELATION TO FARM USE OF FERTILIZER,

Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Div.
Frank G. Viets, Jr.

BioScience, Vol 21, No 10, p 460-467, 1971. 2 tab, 35 ref.

Descriptors: *Water quality, *Crop production, *Fertilizers, *Water pollution sources, Nitrogen, Nitrates, Nitrogen cycle, Phosphorus, Regulation, Groundwater, Runoff, Percolation, Eutrophication, Drainage effects, Detergents, Denitrification, Nitrites, Biochemical oxygen demand.

The extent of commercial fertilizer usage to deterioration of water quality is discussed. The significance of drainage enrichment by fertilizers must be evaluated on the basis of composition of affected drainage and the effects of various land uses. Fertilizers permit higher production on fewer cultivated acres, thus reduction of fertilizers would reduce food supplies and increase food prices. The assembled data indicate that fertilizer restrictions imposed on national or state level would not result in sufficient improvement in water quality to risk hazards of a less abundant food supply. Restrictions could result in more nitrogen and phosphorus in sediment and runoff due to crop expansion of acreage with high erosion hazard (largely row crops) to meet food and fiber requirements. Restriction of fertilizer use within a watershed or ground water basin is in order when facts justify it but restrictions should not be imposed until all sources of nitrogen and phosphorus inputs are inventoried and most effective and least expensive controls imposed from an established factual priority list. (Jones-Wisconsin)
W71-12084

DISTRIBUTION AND ABUNDANCE OF PLANKTONIC CRUSTACEA IN PONDS NEAR GEORGIAN BAY (ONTARIO, CANADA) IN RELATION TO HYDROGRAPHY AND WATER CHEMISTRY,

Waterloo Univ. (Ontario). Dept. of Biology.
John C. H. Carter.

Archiv fur Hydrobiologie, Vol 68, No 2, p 204-231, 1971. 9 fig, 2 tab, 45 ref.

Descriptors: *Distribution patterns, *Plankton, *Crustaceans, *Ponds, Water chemistry, Hydrography, Limnology, Environmental gradient, Hydrogen ion concentration, Conductivity, Standing crop, Predation, Organic matter, Dissolved solids, Suspended load, Biological communities, Temperature, Ions, Color, Copepods, Acidity, Alkalinity, Geomorphology, Daphnia, Lake morphometry, Zooplankton.
Identifiers: *Georgian Bay (Ontario), Flushing, Cyclops, Mesocyclops, Diaphanosoma, Holopedium, Ceriodaphnia, Bosmina, Diaptomus, Eurytemora, Leptodora, Epsichura, Tropocyclops.

A three-year study of zooplankton and other limnological characteristics of 32 ponds near Georgian Bay (Ontario) was conducted. Ponds ranged in water chemistry from very acid and of low conductivity to moderately alkaline and of medium conductivity. Some ponds, landlocked at the beginning of the study later became joined to Georgian Bay while others underwent enlargement of already existing connections due to a rise in water levels of the upper Great Lakes. Marked changes in water chemistry and zooplankton composition accompanied the flooding of previously landlocked ponds. Of 26 species of planktonic Crustacea, nine showed no chemical limitations, three occurred only in acid ponds, six only in alkaline, and eight only in slightly acid and alkaline ponds. That unfavorable water chemistry was responsible for exclusion of 14 species from very acid areas is considered probable. Standing crop was generally greater in very acid than in slightly acid or alkaline ponds. Predation and flushing of both zooplankton and dissolved and suspended organic matter may have been important in reducing standing crops in ponds open to Georgian Bay. Community stability was generally high in ponds landlocked for some years. (Jones-Wisconsin)
W71-12085

BOTTOM SEDIMENTS OF THE LAKES OF VARIOUS TROPHIC TYPE,
Warsaw Univ. (Poland). Chair of Hydrobiology.
Jan Igor Rybak.
Ekologia Polska, Seria A, Vol 17, No 35, p 611-662, 1969. 29 fig, 6 tab, 97 ref.

Descriptors: *Classification, *Bottom sediments, *Lakes, *Trophic level, Organic matter, Calcium, Energy, Methodology, Oxidation-reduction potential, Biochemical oxygen demand, Indicators.
Identifiers: *Mineralization, Calorimetry, Poland.

Samples of bottom sediments to the depth of 5 cm were collected from 50 lakes of the Baltic lowlands and Tatra Mountains of Poland. Determinations included contents of organic matter and calcium, calorimetry, and the rate of mineralization as indicated by oxygen comsumption. The calorific values of sediments were closely correlated with trophic levels of the lakes. Sediments of stagnant waters and those supporting bottom fauna exhibited a very high oxygen consumption. (Wilde-Wisconsin)
W71-12086

TOXICITY AND OXYGEN DEMAND OF DECAYING BARK,
International Pacific Salmon Fisheries Commission, Cultus Lake (British Columbia). Cultus Lake Lab.
James A. Servizi, Dennis W. Martens, and Robert W. Gordon.
Journal Water Pollution Control Federation, Vol 43, No 2, p 278-292, 1971. 7 fig, 10 tab, 23 ref.

Descriptors: *Lumbering, *Bark, *Toxicity, Water pollution sources, Biodegradation, Biochemical oxygen demand, Streams, Salmon, Fish reproduction, Fry, Laboratory tests, Sockeye salmon, Sphaerotilus, Mortility, Dissolved oxygen, Coniferous trees, Water pollution effects.
Identifiers: *Cultus Lake (British Columbia).

This study appraised the effect of bark of coniferous trees on survival of sockeye salmon eggs and fry, oxygen demand, and toxicity. Trials were conducted in gravel-filled incubation boxes with three water velocities and two bark concentrations. The prolonged oxygen demand of bark, development of Sphaerotilus bacteria, and impregnation of gravelly substratum suffocated eggs and alevins. The mortality was particularly great at a high temperature (55F) and high bark concentration (10% by volume). Attention is called to possible toxicity of hydrogen sulfide and other deleterious substances released in the process of bark decomposition. (Wilde-Wisconsin)
W71-12087

AN ESTIMATION OF THE MINIMUM LEVEL OF DISSOLVED OXYGEN IN WATER REQUIRED FOR NORMAL LIFE OF FISH,
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries.
Yasuo Itazawa.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 37, No 4, p 273-276, 1971. 1 fig, 1 tab, 16 ref.

Descriptors: *Dissolved oxygen, *Fish, *Oxygen requirements, Ponds, Fish farming, Temperature, Size, Carbon dioxide, Diffusion, Photosynthesis, Aeration, Respiration, Fish management.

In order to estimate the required volume of inflowing fresh water per unit time for the carrying capacity of a fish pond or fish farm, knowledge of the minimum level of dissolved oxygen in water required for normal life (provisionally named 'the critical level for normal life') of fish is needed. The minimum level of dissolved oxygen in water, required for maintenance of the oxygen content of arterial blood at the normal level, is provisionally named 'the critical level for normal value of arterial oxygen'. Estimates based on cultures of rainbow trout, carp, and eel, indicate oxygen required for maintenance of arterial blood at normal level and that for critical level for normal life almost coincide. Therefore, 'the critical level for normal value of arterial oxygen' is considered a convenient and reliable substitute for 'the critical level for normal life'. This method may be substituted for the lengthly, rather difficult method of keeping dissolved oxygen at constant levels, to study feeding and growth rate of fish and in some cases, the reproductive potential. (Jones-Wisconsin)
W71-12088

PRELIMINARY CHARACTERIZATION OF LAKES IN THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO, USING DIATOM OCCURRENCES IN SEDIMENTS,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
John G. Stockner.
Journal Fisheries Research Board of Canada, Vol 28, No 2, p 265-275, 1971. 4 fig, 5 tab, 42 ref.

Descriptors: *Lakes, *Classification, *Diatoms, *Sediments, Size, Geomorphology, Trophic level, Phytoplankton, Littoral, Analysis, Morphometry, Oligotrophy, Mathematical studies, Eutrophication, Palynology, Paleolimnology.
Identifiers: *Littoral diatoms, *Experimental Lakes area, *Northwestern Ontario, Canada, Centrales, Cyclotella, Melosira, Araphidineae, Latitudes, Biraphidineae, Monoraphidineae, Mesotrophic, Cladoceran, Raphidioidinease.

Dominant diatoms assemblages in surface sediment from undisturbed Precambrian Shield Lakes of varying morphometry and in a short core from Experimental Lakes Area (ELA) lake 240 identified meaningful baseline data for assessing future natural or artificial changes. Diatoms were separated for analysis on basis of habitat preference, into littoral and planktonic groups. Lakes were ranked in order of increasing relative abundance of littoral diatoms recovered from deepwater surface sediment; correlation was found between abundance of littoral diatoms in deepwater sediments and morphometric variables. Centrales was the dominant planktonic group at all sediment depths in most ELA lakes; species of Cyclotella and Melosira were the dominant diatoms. Based on a lake classification scheme using values of the Araphidineae and Centrales ratio from sediment diatom counts, the majority of ELA lakes were classed as oligotrophic. Analysis of a 155-cm core showed little change in diatom species composition over the past 3000-4000 years. The dominant diatoms in sediment of lake 240 and the majority of ELA lakes examined were similar to those dominating deepwater sediments of well-studied oligotrophic lakes in other districts. (Jones-Wisconsin)
W71-12089

CRUSTACEAN PLANKTON COMMUNITIES IN FORTY-FIVE LAKES IN THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
Kazimierz Patalas.
Journal Fisheries Research Board of Canada, Vol 28, No 2, p 231-244, 1971. 5 fig, 6 tab, 27 ref.

Descriptors: *Crustaceans, *Zooplankton, *Distribution patterns, Depth, Geomorphology, Density, Indicators, Daphnia, Biological communities, Copepods, Classification (Biological), Environmental gradient, Histograms.
Identifiers: *Experimental Lakes Area, *Northwestern Ontario, Canada, Calanoid copepods, Tropocyclops prasinus mexicanus, Diaptomus, Cyclops bicuspidatus, Thomasi, Cyclops vernalis, Limnocalanus macrurus, Senacella calanoides, Orthocyclops modestus, Morphometry, Bosmina longirostris, Epischura lacustris, Mesocyclops edax, Holopedium gibberum, Ceriodaphnia, Chydorus sphaericus, Diaphanosoma, Leptodora kindtii, Alona intermedia, Streblocerus serricaudatus.

The Experimental Lakes Area (ELA) was studied to determine whether characteristic zooplankton communities exist in various lake types. Twenty-eight crustacean species were found. Usually the largest deepest lakes, with most transparent water, contained the highest number of species and highest numbers of individuals. Most common species were: Bosmina longirostris, Tropocyclops prasinus mexicanus, Mesocyclops edax, Diaptomus minutus, Holopedium gibberum, and Cyclops bicuspidatus thomasi. Daphnids were scarce. Senecella calacoides, Limnocalanus macrurus, and Diaptomus sicilis were confined to deeper lakes. Diaptomus oregonensis was found mostly in smaller shallower lakes and Diaptomus leptopus in very small, relatively deep, lakes. Diaptomus minutus and C b thomasi, though widely distributed, preferred deeper lakes, whereas T p mexicanus tended towards smaller shallower lakes. Three dominants per lake was common; simplest community contained one cyclopoid, although one cyclopoid, one diaptomid, and one cladoceran were usual. Four community types were distinguished, each characteristic for specific lake size and depth. Similarity between plankton communities of ELA, southern Ontario, and some Great Lakes suggest that all belong to same zoographical area. Most species were distributed evenly throughout ELA indicating relative uniformity of the area. Lake morphology, mainly, determined community type. (Jones-Wisconsin)
W71-12090

EUTROPHICATION AND THE CURRENT CONTROVERSY OVER ITS CAUSES AND CURES,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
A. L. Hamilton.
Presented at 22nd annual convention, Western Canada Water and Sewage Conference, September 23-25, 1970, held at Winnipeg, p 67-71, 1970. 1 fig, 11 ref.

Descriptors: *Water pollution control, *Eutrophication, *Water pollution sources, Population, Industries, Waste disposal, Monitoring, Nutrients, Algae, Insecticides, Herbicides, Heavy metals, Taste, Odor, Recreation, Phosphorus, Carbon, Lake Erie, Detergents, Lake Ontario, Tertiary treatment, International Joint Commission.
Identifiers: Mercury, Phosphorus removal, Lake Washington (Wash).

Acuteness of the waste disposal problem is due to both population and industrial growth. Wastes emptied into aquatic environments belong to two broad groups: nutrients which stimulate life and toxic substances depressing life. The first pollutants, growth stimulators, contribute to eutrophication, the major symptoms of which are accumulation of algae, reduced transparency, unpleasant taste and odor, oxygen deficits, and reduction

recreation potential. Majority of limnologists support the argument that phosphorus is the key limiting nutrient and its input to lakes can be controlled more effectively than that of other nutrients. Efficient and relatively inexpensive methods can remove phosphorus during sewage treatment, and elimination of phosphates from detergents would lower costs of reducing phosphorus levels in effluents. The single most convincing program of practical benefits in reducing phosphorus is exemplified by the diversion of sewage around Lake Washington, providing strong evidence that phosphates were the limiting nutrient and a conclusive demonstration that eutrophication was, at least in this instance, a reversible process. Various arguments favoring reduction of phosphorus inputs may not be entirely conclusive but combined they constitute a very strong case for taking meaningful remedial actions - now. (Jones-Wisconsin)
W71-12091

EFFECTS OF THERMAL DISCHARGES ON THE CHEMICAL PARAMETERS OF WATER QUALITY AND EUTROPHICATION,
Wisconsin Univ., Madison. Water Chemistry Program.
Fred G. Lee, and Gilman D. Veith.
Pre-print: Proceedings International Symposium on the Identification and Measurement of Pollutants in the Environment, held at Ottawa, Ontario, Canada, June 1971. 27 p, 23 ref.

Descriptors: *Thermal pollution, *Chemical reactions, *Water quality, *Chemical properties, Eutrophication, Water temperature, Water pollution effects, Water pollution control, Energy, Diffusion, Thermodynamics, Solubility, Sorption, Pesticides, Toxicity, Dissolved oxygen, Lake Michigan, Algae.
Identifiers: *Thermal discharges.

Depending on the heat assimilative capacity of the receiving water, thermal discharges are divided into two types: those elevating water temperature by 5 to 10C for only a few hours, and those increasing the temperature for several days. The latter discharges may in certain instances lead to deterioration of water quality--intensify objectionable taste and odor, increase algal blooms, and reduce DO concentration. The adverse effects of thermal discharges can particularly be expected when the temperature is increased to about 15 to 20C in nutrient-enriched waters. (Wilde-Wisconsin)
W71-12092

THE PRIMARY PRODUCTIVITY AND LIMITING NUTRIENTS OF LITTLE BROOKLYN LAKE,
Wyoming Univ., Laramie. Water Resources Research Inst.
John F. Wagner.
MS thesis, 1971. 109 p, 8 fig, 32 tab, 107 ref, 28 append. OWRR A-001-WYO (38).

Descriptors: *Lakes, *Primary productivity, *Fish management, Phytoplankton, Zooplankton, Fish, Photosynthesis, Carbon, Absorption, Nutrients, Trout, Fertilization, Statistical methods, Sediments, Chelation.
Identifiers: Artificial fertilization, EDTA, Little Brooklyn Lake (Wyo).

The primary productivity of a small and shallow alpine lake was determined to elucidate the phytoplankton-zooplankton-fish relationships. The photosynthetic uptake of carbon by phytoplankton and autotrophic bacteria was estimated on the basis of added and assimilated C-14. Additions of sediment extract and EDTA were very effective in increasing productivity throughout the summer. Calcium nitrate and di-potassium phosphate exerted a short-lasting stimulation, but ammonium sulfate, potassium carbonate, and potassium hydroxide inhibited the productivity. Artificial fertilization is not recommended because of the extremely rapid removal of nutrients by drainage and fixation by the sediment. (Wilde-Wisconsin)
W71-12094

SCHISTOSOMIASIS, THE DISEASE OF SLOWED-DOWN WATERS: CONTROL IN EGYPT AND THE SUDAN,
Michigan Univ., Ann Arbor. Museum of Zoology.
Henry van der Schalie.
Natural History Special Supplement, The Ecological Aspects of International Development Conference, Conservation Foundation, Washington, D.C., and Center for the Biology of Natural Systems, St. Louis, Missouri, Dec 9-11, 1968, p 62-65. 4 ref.

Descriptors: *Irrigation effects, *Human diseases, *Snails, *Parasitism, *Foreign countries, Irrigation, Irrigation canals, Water pollution, Public health, Ecology, Environmental sanitation, Dams, Life cycles, Aquatic animals, Aquatic plants.
Identifiers: *Africa, *Egypt, *Sudan, *Schistomiasis, *Bilharziasis.

Large dams in Egypt and the Sudan, and the new irrigation systems they supply, have caused a dramatic increase in the debilitating human disease, bilharziasis. Bilharziasis is a form of schistomiastic parasitism in which parasitic flukes spend part of their life cycle in aquatic snails, and are contracted by humans coming in contact with infested water. Man, in turn, reinfests the water by means of urine and feces which contain free swimming forms that seek a snail host, to renew the cycle. Areas of permanent irrigation such as deltas have always had an extremely high incidence of bilharziasis, but now that the dams have created huge areas of land under permanent irrigation, the disease is flourishing, along with the host snails and their requisite food, the aquatic vegetation growing in the canals. Control by sanitation may be possible in the Sudan, but looks doubtful in Egypt, where the sanitary disposal of human wastes is almost impossible because of the high water table. (Yensen-Arizona)
W71-12136

WATER POLLUTION -- 1970, PART 2.
For primary bibliographic entry see Field 05G.
W71-12147

THERMAL POLLUTION: A POTENTIAL THREAT TO OUR AQUATIC ENVIRONMENT,
Maryland Univ., College Park. Dept. of Mechanical Engineering.
James E. A. John.
Environmental Affairs, Vol 1, No 2, p 287-298 (1971). 12 p, 2 fig, 7 ref.

Descriptors: *Thermal pollution, *Cooling water, *Water pollution control, *Water pollution effects, Water pollution sources, Pollution abatement, Water pollution, Cooling towers, Heated water, Ponds, Waste water disposal, Water reuse, Hydroelectric plants, Temperature, Fishkill, Fish reproduction, Eutrophication, Federal government, State goverments, Legal aspects, Regulation, Environmental effects.

The scope of the thermal pollution problem is increasing due to the expanding need for cooling water in the power industry. Cooling water uses are described. More efficient ways are needed to disperse heated water without unduly increasing the temperature levels of even localized areas of rivers or lakes. The effects of thermal pollution are described. The possibility of damage to natural waterways from hot water discharges has encouraged several states and the federal government to impose regulations restricting the maximum temperature in the discharge vicinities. Various cooling methods are detailed, including the use of cooling towers and cooling ponds, and the problems associated with each method are discussed. The key factor in the control of thermal pollution is the selection of a suitable power plant site, which must not be based primarily on economic considerations. The effect of the plant on the ecology of the surrounding area must be considered. Our ultimate goal, attainable with modern technology, should be to utilize power plant waste heat for the benefit, rather than the detriment, of man and his environment. (Smiljanich-Florida)
W71-12149

EFFECTS OF MARINE SEWAGE DISPOSAL,
Water Pollution Research Lab., Stevenage (England).
E. B. Pike, and M. A. Gameson.
Institute of Water Pollution Control, (Water Pollution Research Laboratory Reprint No. 572), 24 p, Conference paper no. 4, Annual Conference, Douglas, Isle of Man, Sept 16-19, 1969. 144 ref.

Descriptors: *Water pollution effects, *Public health, *Ecological distribution, *Aesthetics, Toxicity, Diseases, Waste water treatment, Waste water disposal, Waste disposal, Sewage disposal.
Identifiers: Emotional objection, Diversity index.

Objections to disposal of sewage by discharge to the sea, rivers or estuaries fall into 4 groups. These are medical, aesthetic, ecological and the emotional objection to 'swimming in sewage'. Data collected from several parts of the world over a period of 10-15 years are collated to determine if there is a sound basis for these objections. The data indicate that the probability of contracting a serious disease by swimming in sewage polluted water is so small as to be epidemiologically undemonstrable. Shellfisheries need unpolluted water due to the ability of the shellfish to accumulate pathogens. Ecological changes are not likely to be serious except on the seabed in the vicinity of the outfall. Aesthetic objections can be overcome by screening and comminution of the sewage plus locating the outfall at least 400 m to sea. There is no valid basis for establishing bacterial standards, and existing bacterial standards do not appear to be based on incontrovertible evidence. It would appear uneconomical to spend millions of pounds for better treatment or longer outfalls solely to allay unfounded public suspicions or to further reduce an undemonstrably small medical risk. (Goessling-Texas)
W71-12180

EFFECTS OF TOXIC ORGANICS ON PHOTOSYNTHETIC REOXYGENATION,
Texas Univ., Austin. Center for Research in Water Resources.
Ju-Chang Huang, and Earnest F. Gloyna.
Technical Report No. EHE-07-6701, CRWR-20, August 1967, 163 p, 64 fig, 24 tab, 78 ref. EPA Grant WP-00688-03.

Descriptors: *Reaeration, *Chlorophyll, *Oxygenation, *Toxicity, Organic compounds, *Phenols, Pesticides, Oxidation lagoons, Algae, Photosynthesis, Dissolved oxygen, Laboratory tests, Temperature, Waste water treatment.

The relative toxicity of 33 phenolic-type compounds and 8 pesticides was investigated to determine the extent to which chlorophyll inhibition by certain industrial wastes decreases stream dissolved oxygen contents. Phenolic-type groups included those with mono-and poly-substituted groups such as -Br, -Cl, -CH3, -NO2, -NH2, and -OH. Pesticides studied included DDT, Lindane, 2,4-D, sodium salt of 2, 4-D, 2, 45-T, Dow sodium TCA, Dow Esteron 99, and Dow formula 40. Organic compound toxicity was evaluated in two ways. First, test tube algal cultures were grown and chemostated at 25C under continuous illumination for 72 hours. Knop's solution, including the Hutner-EDTA micro element system, was used as culture medium, and a 5% carbon dioxide in air gas was blown through to supply the inorganic carbon source and the mixing. Secondly, Warburg manometric techniques were used to measure gas exchange occuring when carbonate-bicarbonate buffer is used as a suspending fluid. Results showed the decrease in chlorophyll content to be generally logarithmic to toxic organic concentration, with subsequent suppressed oxygen production. Full scale tests substantiated these conclusions, therefore a toxicity compensation factor must be introduced into design equations for waste stabilization ponds receiving toxic organics. (Lowry-Texas)
W71-12183

PENICILLIN BY THE POUND,
Margaret E. Duffy.

nvironment, Vol 11, No 8, 1969, p 14-21. 2 fig, 0 ref.

Descriptors: *Animal pathology, Disease resistance, *Diseases, Farm wastes, Beneficial use, Poultry, Regulation, Feeds, Cattle.
Identifiers: *Antibiotics, Agricultural uses, Growth promotion, Disease prevention, Hormones, Penicillin, Drugs, Side effects, Therapeutic value, Hemorrhages, FDA.

Antibiotics, hormones and many other medicines used to treat human sickness have found their way into agriculture. The drugs are used to treat animal diseases, to promote growth, to preserve food and to protect plants. Far more antibiotics are used on farms than in hospitals, and the growing reliance on these and other medicines in agriculture raises a host of problems. The most serious of these may be the appearance of resistance in microbes to antibiotic treatment. Most of the antibiotics used in agriculture are added to the feed of cattle, pigs, chickens and lambs in order to promote growth. Antibiotics have had a greater effect on chickens and pigs raised in a previously occupied and therefore unsanitary environment than those raised in sanitized or new quarters. Prolonged feeding with antibiotics has more than once been reported to result in a decreased growth response in chicks. Antibiotics do not promote growth in germ-free animals. Some of the harmful side effects are allergic and toxic effects of drugs, alterations in microbial flora which can cause disease and the development of resistant strains of micro-organisms. Animals may accumulate antibiotics in blood and muscle tissue when given antibiotics in their feed. Hence, antibiotics may find their way into meat products if animals are slaughtered before antibiotic residues have disappeared. (Hazen-Iowa State University)
W71-12237

EFFECTS OF CHLORTETRACYCLINE FEEDING ON BOVINE RUMEN MICROORGANISMS,
Washington State Coll., Pullman. Dept. of Bacteriology.
R. E. Hungate, D. W. Fletcher, and L. A. Dyer.
Journal of Animal Science, Vol 14, 1955, p 997-1002. 1 fig, 3 tab, 7 ref.

Descriptors: *Ruminants, *Feeds, Laboratory tests, Fermentation, Inhibition, Methane bacteria, Microorganisms, Pollutant identification, Water pollution effects.
Identifiers: Manometric experiments, Chlortetracycline feeding.

Manometric experiments of short duration were employed to measure the total fermentation products of rumen contents from chlortetracycline-fed and control animals, both in the presence and absence of additional chlotetracycline. Inhibition by added antibiotic was greater in the control animals, indicating that chlortetracycline feeding had altered the composition of the rumen microbial population. Methane production was diminished by the added chlortetracycline but this was probably a secondary result from inhibition in the production of the intermediates, hydrogen and formate. The potential for microbial activity in the rumen contents from chlortetracycline-fed steers was about the same as in the controls. The rumen micro-organisms appear to be somewhat more sensitive to chlortetracycline than to streptomycin. (Hazen-Iowa State)
W71-12241

5D. Waste Treatment Processes

THE FEASIBILITY OF IRRIGATING SOFTWOOD AND HARDWOOD FOR DISPOSAL OF PAPERMILL EFFLUENT,
Louisiana Tech. Univ., Ruston. Dept. of Agricultural Engineering.
Charles W. Wilson.
Available from the National Technical Information Service as PB-202 561-U, $3.00 in paper copy, $0.95 in microfiche. Paper No 71 - 245, 1971 Annual Meeting, American Society of Agricultural Engineers, Washington State University, Pullman, Wash., June 27-30, 1971. 31 p, 8 fig, 1 tab, 26 ref. OWRR Project A-013-LA (2).

Descriptors: Waste water pollution, Forests, Wood, Wastes, *Irrigation, *Water reuse, Pollution abatement, Costs, Trees, *Hardwood, *Softwood, *Pulp wastes, Industrial wastes, Soil analysis, *Sprinkler irrigation, Effluent, Louisiana, Salinity, Sodium compounds, Water analysis, Irrigation systems.
Identifiers: Tree growth, Black water, White water.

The feasibility of irrigating trees with kraft paper mill effluent to reduce stream pollution during the low flow period of the summer months, the possible increase in tree growth due to this irrigation and possible adverse effects on the soil were determined. For softwoods the possibility of disposing of papermill effluent by irrigation seems promising and would reduce pollution of local streams. Cost of the sprinkler system studied was $137.00 per acre per year. Black water and white water could probably be used in the ratio that they are discharged (80% black water and 20% white water). With the bottomland hardwoods it was determined that 19.3 inches of papermill effluent could be applied during the summer growing season. However, it was recommended that a mixture of 90% white water and 10% black water be used for irrigation. A flood irrigation system would cost $7.43 per year. The average increase relative to hardwood growth was found to be approximately 6 percent.
W71-11644

METHODS OF REMOVING NITRATES FROM WATER,
Interagency Agricultural Waste Water Treatment Center, Firebaugh, Calif.
For primary bibliographic entry see Field 05C.
W71-11698

POTENTIALS FOR REUSE OF WASTEWATER IN NORTH CENTRAL TEXAS,
California Inst. of Tech. Pasadena. W. M. Keck Engineering Labs.
J. E. McKee.
Water Resources Bulletin, Vol 7, No 4, p 740-749, August 1971. 1 tab.

Descriptors: *Water reuse, *Municipal wastes, *Cooling water, Reclaimed water, Water pollution control, Water conservation, Texas, Waste water treatment, Sewage treatment, Tertiary treatment, Water management (Applied).
Identifiers: Trinity River Basin (Tex).

There are several possible ways in which wastewater from municipalities may be reclaimed and reused so as to minimize the need for imported water in North Central Texas. The rationale for reuse is enhanced by the fact that new water quality requirements in the Trinity River system will necessitate a very high degree of treatment at municipal sewage plants, just for discharge to surface streams. The potential market for municipal effluent is the stream-electric power industry. Adequate supplies of condenser cooling water are difficult to obtain and assure. New large power stations might advantageously be located adjacent to municipal wastewater treatment plants, to utilize effluent as make-up water for cooling towers. Treated wastewater can be used for cooling tower make-up with a minimum of trouble, with a considerable saving in overall cost, and with conservation of water for other uses. (Knapp-USGS)
W71-11738

WASTE DISPOSAL AND TREATMENT IN PERMAFROST AREAS - A BIBLIOGRAPHY,
Department of Interior, Washington, D.C. Office of Library Services.
For primary bibliographic entry see Field 10.
W71-11789

NITRIFICATION AND DENITRIFICATION OF WASTE WATER,
Minnesota Univ., Minneapolis. Sanitary Engineering Div.
Walter K. Johnson, and George B. Vania.
Available from the National Technical Information Service as PB-202 350, $3.00 in paper copy, $0.95 in microfiche. Minnesota University, Sanitary Engineering Report No 1755, January 1, 1971, 67 p, 48 fig, 21 tab, 52 ref. FWQA Proj. 17010 FMX 01/71, Grant No. WP 01028.

Descriptors: *Nitrification, *Denitrification, Activated sludge, Municipal wastes, Ammonia, Nitrogen, Nitrates, Eutrophication, Temperature, Flow rate, Biochemical oxygen demand, Sludge, Waste water treatment, Tertiary treatment.
Identifiers: *BOD to nitrogen ratio, Suspended solids.

The denitrification portion of this work was accomplished by continuous flow reactor, a gravity solids-liquid separator, and sludge recycle. A portion of the raw wastewater was added as an external carbon source. By operating two completely mixed biological reactors in series it was possible to accomplish both nitrification and denitrification. Aeration times of 7-9 hours were used to produce a completely nitrified effluent at temperatures as low as 10-12C. Denitrification was accomplished with a 1.3 hour mean reaction tank detention time at 20C and in 2.6 hours at 10C. Effluent ammonia nitrogen was that amount which was added to provide a carbon source. Therefore, addition of wastes with little or no ammonia nitrogen as a carbon source would produce an effluent nearly devoid of ammonia nitrogen. The BOD to nitrogen ratio was shown to be the critical parameter, inasmuch as high ratios would produce a high effluent carbon content, and low ratios resulted in complete denitrification. Keeping the ratio constant resulted in an effluent nitrogen concentration well below 1.0 mg/l. By this same analysis, the rate of nitrate reduction was shown to be a linear function of the sludge loading rate. (Lowry-Texas)
W71-11792

FLUID BED INCINERATION OF PETROLEUM REFINERY WASTES,
American Oil Co., Mandan, N.D. Mandan Refinery.

Copy available from GPO Sup Doc as EP210: 12050 EKT 03/71, $1.50; microfiche from NTIS as PB-202 570-U, $0.95. Water Pollution Control Research Series, March 1971. 110 p, 11 fig, 9 tab, 2 ref. EPA Program 12050 EKT 03/71, Grant No. WPRD 215-01-68.

Descriptors: Waste water treatment, *Waste disposal, *Oily wastes, *Incinerator, Oxidation, Temperature, Evaporation, Thermal insulation, Air pollution, Water quality control, Chemical oxygen demand, Nozzles, Sludge, Particle size.
Identifiers: *Fluidized bed, *Caustic, Suspended solids, Loading rate.

A fluid bed incinerator was designed for the Mandan Refinery of American Oil Company, by the Copeland Process Corporation, to dispose of 10 Bbl/day oil-water separator sludge, 10 Bbl/day emulsion treating sludge and 10 Bbl/day of spent caustic during a 6 hour day for 9 months of the year. During the 3 remaining months an additional 10 Bbl/day of tank washings was expected, and the incinerator was expected to operate 24 hours/day. The unit which was finally installed was equipped with supplemental fuel lines for start-up, waste feed injection from the top to cool the effluent fuel gases, pressure taps for operational control, and an 80 Bbl sump for mixing. Since the rate at which spent caustic can be incinerated is dependent upon the heat content of the oily sludge, initial attempts to mix the two before injection were abandoned in favor of separate feed lines. When injected above the bed, spent caustic could be charged at a rate of 0.042 gal of total feed/1000 BTU. Stack gases were shown to contain less than 0.1 ppm of SO2, no CO when the O2 content was in excess of 8% and only

2.2 volume % of CO when the oxygen content was 5%. The effluent water contained suspended and dissolved solids and COD, but cyclone separator efficiency improvement and scrubber water recirculation show promise in improving the effluent quality. Operating costs were reported as 4.7 cents/gallon of waste, or .095 cents/Bbl of crude oil processed. (Lowry-Texas)
W71-11794

EVALUATION OF A NEW ACID MINE DRAINAGE TREATMENT PROCESS.
Black, Sivalls and Bryson, Inc., Pittsburgh, Pa. Applied Technology Div.

Copy available from GPO Sup Doc as EP210: 14010 DY1 02/71, $1.50; microfiche from N. IS as PB-202 571-U, $0.95. Water Pollution Control Research Series, February 1971. 155 p, 60 fig, 27 tab. EPA Program 14010 DY102/71, 14-12-529.

Descriptors: *Coal mine wastes, *Acid mine water, *Water reuse, Computer models, Distillation, Reverse osmosis, Neutralization, Lime, Economic feasibility, Technical feasibility, Cost analysis, Temperature, Sulfur compounds, *Waste water treatment, Mine drainage.
Identifiers: *Combustion, Slag, Flux, Carbon monoxide.

A two-stage combustion process has been developed to utilize coal refuse in the renovation of acid mine water to potable water. The coal refuse is dissolved in molten iron so that combustion takes place only at the surface. Carbon monoxide formed there is also burned. Energy supplied by the combustion may be used either for distillation or reverse osmosis units. Although the coal refuse is usually high in sulfur content, the two stages of the combustion process insure that the sulfur does not escape to pollute the air, since the refuse sulfur is eventually trapped in the slag and recovered for sale. Laboratory evaluations were made on the various components of the processes, and from these determinations a cost estimate was formulated. Depending on the composition of the acid mine water (coal refuse) used and on the sulfur selling price ($20 to $30/ton), the breakeven price for water for a 5 MGD plant varies from $.42 to $.16/1000 gal when a 14% capital interest charge is used. It is recommended that the kinetics of slag desulfurization, calcium sulfate to calcium sulfide reduction, and carbon solubility rate be more thoroughly investigated and elucidated in the laboratory, along with an evaluation of the refractories used. After these investigations, a revision in the cost estimates should be possible. (Lowry-Texas)
W71-11795

ECONOMIC DISPOSAL OF WASTE SLUDGES FROM WATER TREATMENT PLANTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
P. H. King, H. M. Bugg, J. W. Olver, and D. G. Argo.
Available from the National Technical Information Service as PB-202 562-U, $3.00 in paper copy. Completion Report, August 1971. 8 p, 7 ref. OWRR A-030-VA (2).

Descriptors: *Electrolytes, *Sludge treatment, *Sludge disposal, *Water purification, Separation techniques, Filtration, Waste water treatment, Effluents, Treatment facilities, Waste disposal.
Identifiers: *Sludge drying, *Sludge filtration, Polymer conditioning, *Polyelectrolytes.

The disposal of sludges resulting from conventional water treatment processes such as coagulation, softening, and filtration were examined with a view of developing alternatives to disposal by dilution in cases where water quality stream standards would be violated or in situations where disposal to lagoons would be infeasible due to land costs. Particular attention was given to the parameters of treatment plant operation and to sludge conditioning techniques which result in rapid and thorough sludge dewatering on either open sand drying beds or through use of vacuum filters. The use of newly developed synthetic organic polyelectrolytes as a conditioning aid was investigated. The economics of alternative methods of water treatment plant sludge disposal under varying conditions were evaluated.
W71-11807

ECONOMICS OF WASTEWATER COLLECTION NETWORKS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
Jarir S. Dajani, and Robert S. Gemmell.
Available from the National Technical Information Service as PB-202 418, $3.00 in paper copy, $0.95 in microfiche. Illinois Water Resources Center, Urbana; WRC Research Report No. 43, UILU-WRC-71-0043, July 1971, 65p, 6 fig, 3 tab, 36 ref. OWRR Project A-042-ILL (1).

Descriptors: *Sewers, *Costs, Drainage water, Waste water treatment, *Optimization, Model studies, Cities.
Identifiers: *Cost functions, *Urban service networks, *Public works, *Waste water collection, *Sewerlines, Urban drainage.

The provision of wastewater collection services is used to demonstrate how technological relationships and principles of microeconomics can be used to generate normative cost functions for urban service networks. The study explores both the demand for the service, as measured by parameters of urban development, and the supply of the service, as determined by the basic technology of providing it. A wastewater collection network is first broken down into its basic component: the sewerline or link satisfying a linear demand. A sewerline cost equation is empirically obtained from actual bid information. The concept of optimization is then explored with respect to overall collection networks. Present design methodology and recent developments in both network layout and design are explored. The problem of the optimal choice of a mix of diameters and slopes for a given network, and a specific set of economic and technological inputs, is fitted to a separable convex programming framework, for which a global optimal solution can be obtained using existing commercial computer programs. The nature of an areally distributed demand is dependent on the type of urban development generating it. Population, area and density are basic parameters for the measurement of urban settlements. Following a review of relevant research methodologies and concepts, a 160-Acre experimental module is presented as a basis for the development of normative network cost models. Different population densities and subdivision patterns can be superimposed on this module in a controlled environment.
W71-11861

SECOND ANNUAL REPORT - OPERATION OF THE MULTI-STAGE FLASH DISTILLATION PLANT SAN DIEGO, CALIFORNIA.
Catalytic Construction Co., Philadelphia, Pa.
For primary bibliographic entry see Field 03A.
W71-11869

OPERATION OF THE MULTI - EFFECT MULTI-STAGE FLASH DISTILLATION PLANT (CLAIR ENGLE), FOURTH REPORT (SEMI-ANNUAL), SAN DIEGO, CALIFORNIA.
Catalytic Construction Co., Philadelphia, Pa.
For primary bibliographic entry see Field 03A.
W71-11870

POPULATION DESCRIPTION OF THE NON-METHANOGENIC PHASE OF ANAEROBIC DIGESTION: I. ISOLATION, CHARACTERIZATION AND IDENTIFICATION OF NUMERICALLY IMPORTANT BACTERIA,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 05A.
W71-11875

VIRUS STUDIES ON THE WINDHOEK WASTEWATER RECLAMATION PLANT (SOUTH-WEST AFRICA),
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 05A.
W71-11913

SEWERAGE PROJECT NUMBER WPC-ILL.-754 SUBMITTED BY NORTH SHORE SANITARY DISTRICT, WAUKEGAN, ILLINOIS.
Environmental Protection Agency, Chicago, Ill. Water Quality Office.
For primary bibliographic entry see Field 05C.
W71-11948

IDENTIFICATION AND SURFACTANT DEGRADING ABILITY OF BACTERIA--'STANDARD' SHAKE FASK INOCULUM,
Army Natick Lab., Natick, Mass. Pioneering Research Lab.
For primary bibliographic entry see Field 05A.
W71-11954

COLLECTION OF OIL SLICKS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05G.
W71-11989

CARBON COLUMN OPERATION IN WASTE WATER TREATMENT,
Syracuse Univ. N.Y. Dept. of Chemical Engineering and Metallurgy.
Christopher Vanier, and Chi Tien.
Available from the National Technical Information Service as PB-202 579, $3.00 in paper copy, $0.95 in microfiche. Water Pollution Control Research Series, November 1970, 71 p, 10 fig, 8 tab, 53 ref. EPA-WQO Project 17020 DZO 11/70.

Descriptors: *Activated carbon, *Waste water treatment, *Mathematical models, Computer models, Numerical analysis, Filtration, Adsorption, Diffusion, *Simulation analysis, *Model studies.
Identifiers: *Algorithm, Backwashing, Regeneration.

The Adsorption and filtration of waste water in an isothermal column of granular activated carbon has been mathematically modeled. Based on this model, a simulation program was prepared and coded in Fortran IV to be run on the IBM 360/50 level G compiler. A separate companion study was conducted on the filtration of a clay suspension in an activated carbon bed to provide a filtration rate equation. The equation so obtained was then assumed to represent the filtration rate equation of the wastewater. Adsorption, was considered to be controlled by a combination of liquid phase diffusion and intraparticle diffusion. These two phenomena were then approximated by a solid phase rate expression based upon Glueckauf's linear driving force. In addition to adsorption and filtrations, the effects of backwashing and regeneration were also included in the model. A newly developed algorithm was used for the numerical integration of the pertinent characteristic normal hyperbolic equations. The design of the program allowed a clear separation of calculation framework and column model. This separation was made to permit new discoveries and new theories to be adapted to the basic program with minimal difficulty. The incompleteness and uncertainty of current theories of the carbon contact process will almost certainly make the ease of adaption the most important feature of the program. (Lowry-Texas)
W71-12038

THE SOIL FILTER: A TREATMENT PROCESS FOR REMOVAL OF ODOROUS GASES,
Washington Univ., Seattle. Dept. of Civil Engineering.
Dale A. Carlson, Curtis Leiser, and Robert Gumerman.
Available from the National Technical Information Service as PB-202 580, $3.00 in paper copy, $0.95 in microfiche. Final Report, February 1970, 100 p, 38 fig, 11 tab, 5 ref. Grant EPA Program 17020--02/70, WP 00883-03.

Descriptors: *Odors, *Aesthetics, Biodegradation, Anaerobic conditions, Hydrogen sulfide, Microorganisms, Filtration, Adsorption, Moisture, Flow rate, Saturation, Solubility, Waste treatment.
Identifiers: *Soil filters, *Surface catalysis, Suspended solids.

While the removal of odors emitted from various locations in sewage collection systems by pumping the gases through a soil filter has been well documented, the actual removal mechanisms remained to be established. The experiments performed involved variation of the average particle size and moisture content of the filters, and further experiments were also performed with sterile soil. It was determined that the soil filter was particularly effective in the removal of polar gases such as hydrogen sulfide and methyl mercaptan from waste streams. At hydrogen sulfide concentrations in excess of 100 mg/l the biological removal mechanisms were not significantly operative, and chemical removal mechanisms appeared to prevail. In dry sterile soil, adsorption coupled with surface catalysis reactions were found to be the predominant mechanisms for removal. For low gas concentrations (less than 100 mg/l H2S) the biological removal mechanisms were predominant and wet soil was preferred. Moist loam soil was able to remove 100% of a 775 mg/l mercaptan, in quantities of .85 liter per cu. ft. of soil/week. Methane was not removed in any case. With proper design and care, soil filters operated in a range favorable for the growth of microorganisms can be operated indefinitely. (Lowry-Texas)
W71-12039

OPTIMAL PLANS FOR THE CAPACITY EXPANSION OF A MUNICIPAL WATER TREATMENT-DISTRIBUTION SYSTEM,
Illinois Univ., Urbana, Dept. of Business Administration.
Hirohide Hinomoto.
Illinois Water Resources Center, Urbana, Research Report No. 39, 45 p, 5 fig, 7 tab, 33 ref.

Descriptors: *Linear programming, *Optimization, Water resources development, Water storage, Water supply, Water purification, *Water distribution, Equalizing reservoirs, Cost analysis, Administration, Water demand, Water utilization, Mathematical models, Reservoirs, Illinois, *Water treatment.
Identifiers: *Champaign-Urbana (Ill).

Population increases and rises in the living standards of the increased population have stimulated even higher water demands for residential areas in cities. The economies of scale, which lower the cost per unit volume with increasing facility size, have necessitated much planning and construction with future needs in mind, requiring the formulation of a capacity expansion model. The model assumes several conditions, namely: (1) the scale effects in both capital and operating costs of a treatment plant or distribution reservoir are represented by concave functions of capacity in exponential form; (2) demand continuously increases over a finite period beyond which it stays at the maximum level attained at the end of the period; and (3) facilities existing at the outset and those installed during the planning period are placed by permanent chains of facilities identical with them. Minimization of total cost of investment and operation and a set of constraints on the treatment and storage capacities are the basis for the model formulation. The demands to be satisfied include the expected daily maximum demand, equalization during the daily peak period, and fire fighting. As an example, the model was applied in the Champaign-Urbana area in Illinois. The period 1970 to 1985 was used for forecasting demands and planning new installations, and an interpretation of the results is presented. (Lowry-Texas)
W71-12040

RENDERING DESALINATED WATER POTABLE,
Scientific Research Inst. of Water Transport Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 03A.
W71-12041

ELIMINATION OF CERTAIN ENTERIC VIRUSES AND BACTERIA FROM SEWAGE IN A CIRCULATORY OXIDIZING CHANNEL,
Meditsinskii Institut, Kiev (USSR).
E. I. Goncharuk, L. V. Grigoreva, T. V. Bei, E. V. Shulyak, and G. M. Korchak.
Hygiene and Sanitation, (Russian Translation), Vol 35, No 1, January 1970, p 36-41.

Descriptors: *Activated sludge, *Bacteria, *Viruses, Viricides, Oxidation, Sludge, Adsorption, Fermentation, Analytical techniques, E. Coli, Microorganism, Disinfection, Organic loading, Public health, Diseases, Water quality control, Waste water treatment.
Identifiers: *Circulatory oxidizing channel, Plaque forming units, Phage.

A laboratory scale, 15 liter model of a circulatory oxidizing channel (COC) was used to study the efficiency of the COC in removing pathogenic microorganisms. The unit was filled with a mixture of fresh sewage and activated sludge to which Coxsackie B-5 enteroviruses ECHO 19 viruses, coli bacteriophage, and E. coli, serotype O111, were added in varying amounts. Parameters of the influent sewage included: (1) BOD5 of 100-156mg/l; (2) ammonium nitrogen 14.9-28 mg/l; (3) no nitrates or nitrites; (4) microbial count of 2,940,000-4,200,000; and (5) coli titer of 100,000 - 1,000,000. A three liter flask containing the same mixture of sewage and microorganisms was used as a control. Samples were taken from the COC at 3,6,12, and 24 hours after innoculation, and then on the 2nd, 3rd, 5th, 7th, 9th, days, etc., until two negative results of microorganism presence were obtained. Coxsackie B-5 and ECHO 19 viruses were eliminated from the COC in 24 and 48 hours respectively. Sewage seeded with 50 and 6000-7 000 plaque forming units (PFU) of E. coli bacteriophage was free of bacteriophage after 12 and 16 hours respectively. However, pathogenic serotypes of E. coli were recovered for 3-7 days from an initial contamination of 1 million/liter, and for 15-18 days for a contamination of 100 million/liter, coxsackie B-5, ECHO 19, and E. coli bacteriophage were recovered from the active slime on the 3rd, 5th, and from 15 to 25 days respectively. Two days detention in a COC was shown to be highly effective in microorganism removal, but disinfection of treated effluent is still an obligatory measure to guard against pathogenic releases to receiving waters during periods of system upset, etc. (Lowry-Texas)
W71-12043

PROCESSING OF WATER WITH POTASSIUM PERMANGANATE FOR THE ELIMINATION OF TASTES AND ODORS,
For primary bibliographic entry see Field 05F.
W71-12045

NEW DATA ON THE MECHANISM OF DISINFECTION OF DRINKING WATER BY CHLORINE AND GAMMA RADIATION,
Moscow Medical Inst. Dept. of Environmental Hygiene (USSR).
For primary bibliographic entry see Field 05F.
W71-12048

EFFICIENCY OF WATER POLLUTION CONTROL IN SHALE-PROCESSING COMBINES,
Estonskii Institut Eksperimentalnoi i Linicheskoi Meditsiny, Tallinn (USSR).
I. A. Veldre.
Hygiene and Sanitation, (Russian Translation), Vol 34, No 12, p 413-417, December 1969. 3 tab.

Descriptors: *Oil shale, *Oil wastes, Phenols, Color, Odors, Separation techniques, Filtration, Biodegradation, Biochemical oxygen demand, Industrial wastes, Water re-use, Waste water treatment.
Identifiers: *Tar.

Tar waters from several shale processing plants in Russia were analyzed and found to contain: (1) a phenolic odor intensity of '4-5 points'; (2) a brown-yellow or cinnamon color; (3) an olfactory threshold at a dilution of 1:4000 to 1:10,000; and (4) a color threshold of 1:200-1:500. BOD averaged 8000-9000 mg/l but was as high as 14,000 mg/l. These effluents are dephenolized by extraction with butylacetate and then detarred in three stages to a residual tar content of 10-35 mg/l (detarring efficiency is approximately 97%), and then mixed with domestic and other plant wastes for biological treatment. The effluents from the Kokhtla-Yarve complex pass into the Gulf of Finland with a phenolic odor of '2-3 points', a yellowish color, 2-4 mg/l monohydric and 30-40 mg/l dihydric phenols, and 50-60 mg/l BOD. Other processors produce wastes of similar characteristics. In each instance, the removals are not sufficient to prevent pollution nuisance in the receiving waters. In each instance, in-plant housekeeping and re-use of water have been suggested as beneficial in reducing pollutional loads, and most of the current efforts are being directed to that end. (Lowry-Texas)
W71-12049

THE ROLE OF CONTACT STABILIZATION IN THE TREATMENT OF INDUSTRIAL WASTEWATER AND SEWAGE: A PROGRESS REPORT,
Water Pollution Research Lab., Stevenage (Engoand).
A. G. Boon.
Water Pollution Research Laboratory, Report No. 559. 19 p, 5 fig, 9 tab, 19 ref.

Descriptors: *Activated sludge, *Pilot plants, Absorption, Adsorption, Aeration, Oxidation, Organic loading, Colloids, Industrial wastes, Domestic wastes, *Waste water treatment, *Treatment facilities.
Identifiers: *Biosorption, *Contact stabilization.

Contact stabilization pilot plants were fed milk processing wastes, spent metabolite wastes from the pharmaceutical industry, and domestic sewage. A conventional activated sludge pilot plant was fed the same sewage feed for a direct comparison. Since initial, rapid adsorption and absorption of suspended or collodial matter has been documented as the primary advantage of the contact stabilization modification, the process should be particularly suited to the two industrial wastes, and somewhat less suitable for domestic wastes. Analysis showed the BOD of the milk wastes to be reduced by 65% with a 0.8 hour contact time, a 3.3 hour reaeration time, and .65 Kg BOD/Kg sludge/day at 20 C and 1.16 Kg BOD/Kg sludge/day at 25 C. 50 to 86% BOD reduction of spent metabolite wastes was accomplished at contact times from 0.5 to 1.6 hours, reaeration times from 1.6 to 4 hours, and loadings for the 86% removal of .34 Kg BOD/Kg sludge/day. Similar performance was experienced for both methods with the domestic sewage. However, the detrimental effects of over-aeration of the sludge were noted and reaeration time adjusted. Individual studies must be performed to determine optimal contact and reaeration times for each waste. Research subjecting both pilot plants to: (1) a wider range of BOD loading; (2) hydraulic loading variations; (3) inhibitory substances; and (4) treatment before primary sedimentation, is continuing. (Lowry-Texas)
W71-12050

MODERN METHODS OF DISPOSAL OF SLUDGE,
Water Pollution Research Lab., Stevenage (England).
J. D. Swanwick.
Journal of the Institution of Municipal Engineers, Vol 96, No 3, p 77-80, 1969. 2 fig, 17 ref.

Descriptors: *Sludge, *Sludge disposal, Municipal wastes, Sedimentation, Coagulation, Dewatering, Centrifugation, Oxidation, Incineration, Anaerobic digestion, Temperature, Pressure, Toxicity, Detergents, Land reclamation, *Waste treatment, *Waste disposal.

Approximately 75% of the incoming suspended solids to a municipal sewage treatment plant is removed by primary sedimentation. Disposal of this material, usually less than 0.5% of the incoming volume, accounts for 1/3 of the total cost of sewage treatment. Anaerobic digestion is by far the most widely known and widely used method of reducing the volume of sludge to be disposed of. However, wet air oxidation has been successfully practiced at several installations in the United States. Reductions of as much as 96% of the insoluble volatile matter have been reported. In addition, batteries of heat exchangers to recover heat from the treated sludge, and a turbine to recover energy as electricity from depressurization of the waste gases allow the Chicago plant to supply 79% of its own power when operating on a 3.0% solids average of the feed sludge. When using a 4.4% solids content sludge, the plant would be totally self-contained. Heat treatment and centrifugation are also gaining favor in the battle to reduce sludge volume. After volume reduction, present final disposal methods are currently limited to landfill, sea disposal, or agricultural use on crop land. However, research is continuing in incineration and other methods. (Lowry-Texas)
W71-12051

OZONATION, NEXT STOP TO WATER PURIFICATION,
For primary bibliographic entry see Field 05F.
W71-12052

FUNDAMENTALS OF ION EXCHANGE IN WATER TREATMENT,
Diamond Shamroch Chemical Co., Redwood City, Calif.
C. S. Parks, and I. M. Abrams.
Heating, Piping and Air Conditioning, Vol 42, No 8, p 98-102, August 1970. 9 fig, 3 tab.

Descriptors: *Ion exchange, *Water purification, Industrial wastes, Industrial water, Anion exchange, Cation exchange, Demineralization resins, Separation techniques, Tertiary treatment, Water softening, Analytical techniques, Calcium carbonate, Calcium, Magnesium, Alkalinity, Acidity, Hydrogen ion concentration, Neutralization, Design criteria, Cost analysis, Water treatment.
Identifiers: *Equivalents, Chloride cycle ion exchange, Exchange resins.

Ion exchange is a phenomenon which has applications in the treatment of water. A water analysis with the amounts of impurities expressed as their calcium carbonate equivalents is required in order to design an ion exchange installation for water treatment. One type of ion exchange water treatment is used industrially when hard water must be softened by passage through a column of cation exchange resin in the sodium form. The sodium on the resin replaces calcium and magnesium ions. Another type of ion exchange treatment is needed to reduce the alkalinity in water. All the systems for reduction of alkalinity involve the use of either chloride cycle anion exchange or the use of weakly acidic cation exchange resin and/or strongly acidic cation exchange resin. Ion exchange also could be useful in demineralization of water which is needed for the treatment processes in which extremely high purity water is desired. This is accomplished by passage of water through both cation and anion exchange resins. The methods for doing this are many and varied. Consultation with water treatment equipment manufacturers or design engineers when selecting the proper ion exchange systems and resins should be a matter of course. (Atkins-Texas)
W71-12053

AN ASSESSMENT OF POLYELECTROLYTES FOR SLUDGE CONDITIONING AT WORTHING,
Borough of Worthing (England).
R. E. Sleeth.
Water Pollution Control, Vol 69, No 1, p 31-38. 4 fig, 3 tab, 1 ref.

Descriptors: *Sludge, *Dewatering, *Cost comparisons, Lime, Filtration, Mixing, Storage, Waste water treatment, *Electrolytes, Sludge treatment.
Identifiers: *Polyelectrolytes, *Sludge conditioning, Floccotan, Decapol, Reten, Magnafloc, *Worthing (Great Britain).

Reten, Floccotan, Magnafloc, and Decapol were studied in full scale plant experiments to assess their relative merits for sludge conditioning. Sludge was collected from two treatment plants, one with a 1.3 mgd capacity, and one of 4.8 mgd capacity. The tests were performed to determine the validity of claims made about the polyelectrolytes. These advantages included: (1) polyelectrolytes are inert and they would be less susceptible to bacterial inhibition; (2) only a single chemical would be used, facilitating control; (3) reduced chemical dosages would reduce storage requirements; (4) polyelectrolytes, in a clean white powder form, would improve handling conditions; and (5) existing plants could use polyelectrolytes without extensive modification. Disadvantages known to exist were: (1) a special procedure was needed to prepare solutions of the chemical for introduction to the waste; and (2) difficulties might be encountered in controlling the addition of small amounts of an expensive material. Test results showed that all polyelectrolytes performed better than lime and copperas, with Floccotan being the optimum for this particular application. In addition, estimated savings based on initial performance would be approximately 1500 pounds per year. The validity of all originally claimed advantages was substantiated, while the disadvantages proved to be insignificant. (Lowry-Texas)
W71-12055

BIOTIN PRODUCTION AND UTILIZATION IN A SEWAGE TREATMENT LAGOON,
North Dakota Univ., Grand Forks, Dept. of Microbiology.
Gordon M. Fillipi, and John W. Vennes.
Applied Microbiology, Vol 22, No 1, p 49-54, July 1971. 2 fig, 6 tab, 16 ref.

Descriptors: *Vitamins, *Oxidation lagoons, Sewage treatment, Organic loading, Biochemical oxygen demand, Hydrogen ion concentration, Light intensity, Temperature, Aerobic conditions, Anaerobic conditions, Municipal wastes, Industrial wastes, Sampling, Incubation, Membrane processes, Analytical techniques, Metabolism, North Dakota, Waste water treatment.
Identifiers: *Biotin, *Grafton (No Dak).

A sewage oxidation lagoon in Grafton, North Dakota was sampled at weekly intervals during the summer of 1969. Samples were then analyzed to determine the concentration of the vitamin biotin, with the hope of establishing biotin production as an indicator of both biological activity and incomplete stabilization of wastes discharged to rivers. A variety of lagoon heterotrophs were isolated from the lagoon in pure culture and tested for their biotin synthesizing ability. Chlorella vulgaris and Thiocapsa floridana were found to be associated with biotin utilization while Aerobacter aerogenes was associated with biotin production. Biotin in the primary cell of the waste treatment lagoons increased from 100 to about 10,000 ng/liter during the anaerobic and purple sulfur growth phases, but during the terminal stages of purple sulfur bacterial growth, nearly 99% of the biotin was again utilized. Biotin in the secondary cell followed much the same pattern, but stayed at 10,000 ng/liter until just before the algal phase. Biotin levels in seventy river and lake samples averaged 4.6 ng/l, but downstream from known effluents, concentrations averaged 23.5 ng/l. During the summer months, algal utilization of biotin produced the 4 ng/liter average concentration within 10 to 15 miles of the effluent outfall. (Lowry-Texas)
W71-12056

SELECTED INFORMATION ABOUT REPORTED RESEARCH ON THE SUBJECT OF POLLUTION DUE TO STORM WATER AND OVERFLOWS FROM COMBINED SEWAGE,
Nova Scotia Technical Coll., Halifax. Atlantic Industrial Research Inst.
D. H. Waller.
Central Mortgage and Housing Corporation Project on Pollution due to Storm Water and Overflows from Combined Sewers, Technical Report No 1, October 25, 1968. 21 p, 5 tab, 90 ref.

Descriptors: *Storm runoff, *Domestic wastes, *Sewers, Flow rates, Microorganisms, Coliforms, Viruses, Biochemical oxygen demand, Chemical oxygen demand, Nitrogen, Phosphates, Dissolved oxygen, Sedimentation, Disinfection, Chlorination, Water quality control, Sampling, New York.
Identifiers: *Combined sewers, Suspended solids, *New York (N.Y.).

A two-year study has been undertaken to study the pollutional effects of both storm runoff and the overflow from combined domestic waste and storm sewers. Both storm sewer and combined sewer waters were analyzed for solids, BOD, nitrogen and phosphorous, and bacteria in an effort to determine the effects of these waters on a receiving water. Coliform densities were obtained from sampling stations in New York City beach areas which varied 14 to 1 to 0.5 to 1 wet population versus dry population based on the geometric mean. In 17 out of 24 cases, the bacterial count during wet weather was 2 or more times the dry weather count. These and other studies indicated that storm runoff which had not been contaminated by domestic sewage was still causing much pollutional damage. References are given for the treatment that has been considered to date, namely screening, disinfection and/or sedimentation. The role of solids in the collection system is also discussed along with the percentages occurring in various flows. (Lowry-Texas)
W71-12057

DESALTING TECHNOLOGY IN POLLUTION-CONTROL PROBLEMS,
Reading and Bates Offshore Drilling Co., Tulsa, Okla.
For primary bibliographic entry see Field 03A.
W71-12058

OPTIMIZATION STUDIES OF TWO WATER PURIFICATION SYSTEMS,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
T. D. Denchfield.
Selected Portions of a Master's Thesis, Kansas State University, 1967, p 102-170, 7 fig, 11 tab, 12 ref.

Descriptors: *Optimization, *Oxication lagoons, *Waste water treatment, Kinetics, Economics, Mathematical models, Computer models, Cost comparisons, Land appraisal, Aeration, Electric power costs, Biochemical oxygen demand, Chemical oxygen demand, Nutrients, Dissolved oxygen, Model studies.
Identifiers: *Process optimization, Horsepower.

The American Oil Company's Sugar Creek Refinery waste treatment lagoon was the partial pattern for a mathematical lagoon model, with

several of the model's constants being derived from the operational data of the lagoon. Separate models were initially developed for the biodegradation kinetics, flow through the lagoon, and economics of the process. Both the biodegradable and non-biodegradable components, as well as the chemical oxygen demand were accounted for in the kinetics model. The economics model included land cost, aerator sizing and cost, electric power, and structures. The objective of these performance equations was to determine the volume per stage, the aerator motor size, and the number of stages required for the biodegradation section of an aeration basin which is used to achieve a specified waste reduction, while at the same time minimizing the cost. The Sugar Creek aeration basin is used as a sample problem, and all computational routines used are illustrated. (Lowry-Texas)
W71-12059

OPTIMIZATION STUDIES OF ACTIVATED SLUDGE AND REVERSE OSMOSIS WATER PURIFICATION PROCESSES,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
Lewis Yuh-shu Ho.
Selected portions of a Master's Thesis, Kansas State University, 1967, 144 p, 24 fig, 6 tab, 17 ref.

Descriptors: *Activated sludge, *Mathematical models, *Optimization, Operations research, Analytical techniques, Mixing, Numerical analysis, Computer models, Waste water treatment, *Water purification, *Simulation analysis, Model studies, Flow.
Identifiers: *Step aeration, Plug flow, Tank reactor, Discrete maximum principle, *Flow reactors.

Optimization studies were performed on three different flow configurations, including a completely mixed stirred tank reactor, a plug flow reactor, and a composite system containing both. Each system was mathematically modeled, considering all reaction vessels and flows to be idealized, which simplified the calculations considerably. A simulation study, incorporating material balance equations for each segment, and the number of degrees of freedom per variable, was performed on an IBM 1620 computer. After the systems had been simulated, they were optimized by the discrete maximum principle, the important variables being the distribution of the organic load and the flow behavior. Tables were prepared of data demonstrating that the step aeration modification is of significant value in certain situations. A continuous feed allocation along a plug flow reactor was demonstrated as the optimum step aeration configuration, although specific numbers presented may be misleading. Further research to firmly establish more realistic flow models and results is indicated. (Lowry-Texas)
W71-12060

BIOENERGETICS OF ACETATE AND ACETATE PRECURSORS IN METHANE FERMENTATION,
California Univ., Berkeley. Sanitary Engineering Research Lab.
Jan Sherfig, and Erman A. Pearson.
California University, Sanitary Engineering Research Laboratory, Report No 68-9, October 1968, 133 p, 21 fig, 31 tab, 86 ref.

Descriptors: *Energy budget, *Kinetics, *Anaerobic digestion, Methane, Carbon dioxide, *Fermentation, Analytical techniques, Sludge, *Waste water treatment, *Sludge digestion, Optimization, Biodegradation.
Identifiers: *Acetate, Acetate precursors, Process optimization, *Methane fermentation.

A true optimization of the anaerobic sludge digestion process has never been achieved because no attempts have been made to determine the process fundamentals. Energy balance methods revealed that acetate alone may or may not be sufficient to support cell growth in methane fermentation, so nine related carbon compounds were investigated. A laboratory study consisted of three phases: (1) investigation of the role of acetate and acetate precursors in relation to their theoretical energy yields; (2) determination of steady state concentrations and initial decomposition rates of acetate and acetate precursors in glucose fed cultures; and (3) determination of steady state decomposition rates and corresponding cell and ATP yields for glucose, acetate, and lactate was made. Acetate was found to be a precursor for between 1/3 and 1/2 of the methane produced, considerably less than results from other studies indicated. Lactate was also shown to account for a considerable amount of the methane produced, while propionate was credited with only 10% and molecular hydrogen less than 1%. Cell energy yield analyses also indicated that another pathway might also exist, but the actual mechanism was not determined. The 'Two-stage Theory' of methane fermentation seemed to be a gross over-simplification, since methane precursors other than the common lower fatty acids appeared of near equal significance in the glucose fed culture investigated. (Lowry-Texas)
W71-12062

MICROBIAL RELEASE OF SOLUBLE PHOSPHATE IN AN ACTIVATED SLUDGE ENVIRONMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
Clifford W. Randall, Bruce S. Hulcher, and Duane W. Marshall.
Available from the National Technical Information Service as PB-202 583, $3.00 in paper copy, $0.95 in microfiche. Water Resources Research Center Bulletin 36, 1971. 44 p, 16 fig, 3 tab, 19 ref. OWRR A-024-VA (4).

Descriptors: *Phosphates, *Sewage treatment, *Activated sludge, Nutrients, Sewage effluents, Eutrophication, Water pollution control, Biological treatment, Laboratory tests, Hydrogen ion concentration, Dissolved oxygen, Oxidation-reduction potential, Sorption.
Identifiers: Phosphorus removal, Phosphate release, Anoxic phosphate release, Activated alumina.

Laboratory trials indicated that the release of soluble phosphates from activated sludge occurs primarily under anaerobic conditions. The rate of release was relatively independent of chemical environment, but corresponded to the expected death rate of microorganisms. The rapid release coincided with zero DO concentration. The release was retarded by the presence of organic substrate at the start of anoxia, but was accelerated with a higher concentration of mixed liquor suspended solids. Disruption of microbial cells is the major harmful effect of the phosphate release. Fixation of wastewater phosphorus by activated alumina is a desirable practice as it exerts no toxic influence on microorganisms. (Wilde-Wisconsin)
W71-12065

RHONE-MEDITERRANEAN-CORSICA BASIN AGENCY (AGENCE DE BASSIN RHONE-MEDITERRANEE-CORSE),
Agence de Bassin Rhone-Mediterranee-Corse, Paris (France).
For primary bibliographic entry see Field 05G.
W71-12101

INFLUENCE OF SURFACE ACTIVE AGENTS ON OXYGEN ABSORPTION TO THE FREE INTERFACE IN A STIRRED FERMENTOR,
Michigan Univ., Ann Arbor. Dept. of Chemical and Metallurgical Engineering.
Daniel N. Bull, and Lloyd L. Kempe.
Biotechnology and Bioengineering, Vol XIII, No. 4, p 529-547, July 1971. 8 fig, 1 tab, 30 ref.

Descriptors: *Oxygenation, *Absorption, *Surfactants, Dissolved oxygen, Aeration, Diffusivity, Mixing, Saturation, Solubility, Turbulence, Air-water interfaces, Analytical techniques, *Waste water treatment, Reaeration.
Identifiers: *Antifoam.

Three laboratory scale fermentors of 390, 40 and 5 liters, respectively, were used to study the effect of surface active polymer on reaeration by absorption. Polymers used were Polyglycol P-200 and Silicone antifoam B. Physical absorption coefficients were measured in the three vessels at 25C and at various agitation rates. Measurements were obtained with a dissolved oxygen electrode which was standardized between no dissolved oxygen and saturation. The rate of change of dissolved oxygen then equaled the rate of oxygen absorption, and the specific absorption coefficients were calculated using values of C and t. Coefficients for absorption into soft water were found to be independent of the instantaneous dissolved oxygen concentration, while upon addition of the surface active agent, the coefficients became strongly dependent upon the dissolved oxygen concentration. The degree of non-linearity of the coefficients was a function of the rate of agitation of the liquid. It was also determined that the coefficients were independent of the amount of surfactant added above a very low level. Finally, absorption coefficients for bubble aeration were found to be independent of the instantaneous dissolved oxygen concentration even when the surface active agent was present. (Lowry-Texas)
W71-12177

POLYELECTROLYTES IN THE FILTRATION OF SEWAGE SLUDGES,
Water Pollution Research Lab., Stevenage (England).
R. S. Gale, and R. C. Baskerville.
Filtration and Separation, Jan-Feb, 1970, (Water Pollution Research Laboratory Reprint No. 578). 12 p, 7 fig, 12 tab, 10 ref.

Descriptors: *Sludge treatment, *Separation techniques, Lime, Dewatering, Coagulation, *Filtration, Hydrogen ion concentration, Temperature, Mixing, Shear, Vacuum drying, Ammonia, Electrolytes, *Waste water treatment.
Identifiers: *Polyelectrolytes, *Aluminum chlorohydrate.

Nine manufacturing firms participated in an evaluation of the economic and technical feasibility of using polyelectrolytes, instead of lime and ferric sulfate or aluminum chlorohydrate, as filter aids. Each company was allowed to submit two compounds for each type of sludge tested, and economic evaluations were assembled. Concentrations of the stock chemicals to be supplied were constrained such that if 20 ml of chemical was added to 100 ml of sludge containing 5% dry solids, then the cost does would be 200 shillings per ton of dry solids. The wide variety of results obtained indicated that performance varied with: (1) type of sludge treated; (2) dosage; (3) pH; (4) age of solution; (5) mixing; and (6) type of water used to prepare the polyelectrolyte solutions. Difficulty was also experienced in adapting laboratory information to full scale design due to uncertainties in scale up. However, the work performed has provided more information as to which variables need to be closely monitored in subsequent testing. (Lowry-Texas)
W71-12181

DESIGN PARAMETERS OF EXTENDED AERATION ACTIVATED SLUDGE TREATMENT,
Nova Scotia Technical Coll., Halifax. Dept. of Civil Engineering.
D. Thirumurthi, and E. A. Ross.
Research Report Presented at Engineering Institute of Canada General Meeting, Ottawa, Canada, September 1970, EIC-71-CIU 6. 3 p, 1 fig, 3 tab, 5 ref.

Descriptors: *Sludge treatment, *Activated sludge, *Sludge disposal, Laboratory tests, Organic loading, Temperature, Biochemical oxygen demand, Domestic wastes, Nutrients, Metabolism, Microorganisms, *Aeration, Waste water treatment.

Identifiers: *Extended aeration.

Three identical 5 liter aeration tanks were used in laboratory scale studies of the extended aeration process. The tanks were fed at a rate of 3.5 liters once a day, but over an eight hour period. The aeration of the tanks continued 21 hours per day, with the remaining three hours used for settling. After settling 3.5 liters of clarified effluent was drained off leaving all the sludge. The mean organic load was 7.3 lb BOD/1000 cu. ft/day. Tank 1 was operated as a closed system, tank 2 an open system where sludge in excess of starting sludge was wasted daily, and tank 3 as an intermediate type where excess sludge was wasted weekly. Results from 48 days of operation showed no upset from not removing sludge from tank 1, so the loading rate was doubled to 15 lbs BOD/1000 cu. ft/day. 55 days of operation again revealed no ill effect on the closed system. Therefore, when the organic loading is less than 15 lbs BOD/1000 cu. ft/day, daily or weekly sludge wasting has no effect on performance and is mainly an operational nuisance. Based on laboratory data, an extended aeration system operated at 20C can operate for as long as 55 days at a loading of 15 lbs BOD/1000 cu. ft/day without sludge wastage. A full scale field study is recommended to study the scale up factors in these results. (Lowry-Texas)
W71-12182

EFFECTS OF TOXIC ORGANICS ON PHOTOSYNTHETIC REOXYGENATION,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 05C.
W71-12183

ASPECTS OF THE DISTRIBUTION, LIFE HISTORY, AND METABOLISM OF THE ENCHYTRAEID WORMS LUMBRICILLUS RIVALIS (LEVINSEN) AND ENCHYTRAEUS CORONATUS (N AND C) IN A PERCOLATING FILTER,
Water Pollution Research Lab., Stevenage (England).
N. V. Williams, J. F. de L. G. Solbe, and R. W. Edwards.
Journal of Applied Ecology, Vol 6, p 171-183, Aug 1969, (Water Pollution Research Laboratory Reprint No 574). 13 p, 10 fig, 1 tab, 14 ref.

Descriptors: *Waste water treatment, *Filters, *Invertebrates, Population, Organic compounds, Filtration, Oxygen demand, Respiration, Metabolism.
Identifiers: *Lumbricillus rivalis, *Enchytraeus coronatus, Cocoons, Assimulation.

The role of invertebrates, Lumbricillus rivalis and Enchytreus coronatus, in maintaining filter efficiency has been studied over a two year period. A filter described by Solbe, Williams and Roberst was used. Sixteen shafts 30 cm in diameter penetrated the full depth of the filter. One to three of these shafts were removed monthly for an enumeration of the enchytaeid worm and cocoon population. L. rivalis and E. coronatus were the dominant species throughout the filter, the former being more numerous at the top and the latter more numerous at the bottom of the filter. Maximum cocoon deposition occurs February-May when adults are more numerous. Cocoon washout rate never exceeded 13% and was generally less than 2.5%. Worms achieved adulthood over a large range of worm size. The washout rate of worms in the summer is less than the decline in population. Oxygen consumption of L. rivalis measured with a Cartesian diver respirometer, is proportional to the 0.82 power of body weight. Previous data suggests L rivalis and E. coronatus consume oxygen at nearly the same rate. Calculations based on respiration rates suggest that enchytraeid worms account for about 3% of the organic carbon dissipated in the filter. (Goessling-Texas)
W71-12184

TREATMENT OF EFFLUENTS,
Water Pollution Research Lab., Stevenage (England).
S. Jackson.
New Horizons for Chemistry and Industry in the 1990's, Symposium organized by Society for Chemical Industry, 1969, (Water Pollution Research Laboratory Reprint No 599). 2 fig, 46 ref, 6 fig.

Descriptors: *Waste water treatment, *Activated sludge, *Contact stabilization, *Filtration, *Trickling filters, Sludge, Tertiary treatment, Reclaimed water, Electrodialysis, Reverse osmosis, Water quality.
Identifiers: Micro-straining, Chemical treatment.

It is predicted that water use in the U.K. will double by the year 2000. The increased demand for water makes the treatment of effluents of much greater importance. Advances in waste water treatment can be expected along three parallel lines. The first is improvement in the reliability and economy of those processes already widely used, activated sludge, contact stabilization, and biological filters. Improvements can be expected in sludge conditioning and handling. The second is an increase in the use of 'polishing' processes such as micro-straining and sand filtration to produce effluents of 10:10 quality. The third is the use of advanced treatment systems, electrodialysis, reverse osmosis, required by the necessity to reclaim water of high quality for reuse in industry. Widespread use of automated monitoring and controls of new processes can be predicted. It seems unlikely that chemical processes can become economically competitive with biological processes in treating organic effluents, but there is plenty of room for technical innovations. (Goessling-Texas)
W71-12185

STUDIES ON THE VACUUM FILTRATION OF SEWAGE SLUDGES,
Water Pollution Research Lab., Stevenage (England).
R. S. Gale, and R. C. Baskerville.
Journal of the Institute of Water Pollution Control, No 5, 1970, (Water Pollution Research Laboratory Reprint No 603). 28 p, 10 fig, 6 tab, 13 ref.

Descriptors: *Vacuum drying, *Filtration, *Sludge, Dewatering, Moisture, Flocculation, *Mathematical models, Shear, Mixing, Pilot plants, Waste water treatment, Sewage, Model studies.
Identifiers: *Specific resistance, *Filter cloth, Polyelectrolytes, *Vacuum filtration.

A mathematical model of the vacuum filtration process was developed. This model deviated from previously formulated models in that: (1) it recognizes that the filtration parameter usually calculated from Buchner funnel tests is not the true specific resistance but an apparent specific resistance; (2) to allow for this discrepancy, a function of the solids content of the sludge and the solids content of the cake during formation is introduced; (3) no equation allowing for the resistance of the filter medium is presented. The equation was successfully used to predict the yield from both a pilot scale and a full scale facility within plus or minus 30%, a remarkable achievement considering the fact that a proportion of the cake dropped off under all conditions. The fact that stable operation was obtained even with substantial drop-off indicated that the solids content increase of the sludge almost completely compensated for the drop-off. The investigations also emphasized that optimum conditions could be obtained only by a compromise between: (1) filter speed and cake thickness; (2) submergence and cake moisture content; (3) chemical conditioning and both moisture content and yield and (4) solids content increase and moisture content. (Lowry-Texas)
W71-12186

REMOVAL OF HEAVY METALS FROM MIN DRAINAGE IN COLORADO BY PRECIPIT TION,
Denver Univ., Colo.
E. B. Pugsley, C. Y. Cheng, D. M. Updergraff, anc L. W. Ross.
Chemical Engineering Progress, Symposium Serie Vol 67, No 107, p 75-89, 1971. 17 fig, 1 tab, 23 re

Descriptors: *Water treatment, *Precipitatio *Mine drainage, Economics, Oxidation, Nutrient Sludge, Hydrogen ion concentration, Ions, Ten perature, Colorado, Acid mine water, *Heav metals.
Identifiers: *Desulfovibrio-Desulfuricans, *Clo tridium.

The Federal Water Pollution Control Administra tion recently stated that an average of 10 mi gal./day of mine drainage flows into the Colorad River Basin, in the state of Colorado. It was als found that drainage from nonworking mines more detrimental than that of working mine Rocky Mountain mine drainage in Weste Colorado is a more toxic water pollutant than Ap palachian drainage because it is so highly acid (pH 1.5) and contains considerable quantities of zinc copper, manganese, aluminum, lead, cadmium an arsenic, in addition to a high content of iron. Th pollution can be abated by partial neutralization t about pH 3.5 removing ferric iron and sulfide add tion to fractionally precipitate certain of th metals. Zinc, sulfur and ferrous iron are especiall amenable to this process. Cultures of Desu fovibrio-Desulfuricans have been shown to grow i partially neutralized mine water and produce suff cient hydrogen sulfide for metal fractionation Three possible continuous treatment processe have been proposed based upon these findings (Gutierrez-Texas)
W71-12187

FACTORS INFLUENCING PHOSPHOROU REMOVAL BY BIOLOGICAL TREATMENT,
Federal Water Quality Administration, Cincinnat Ohio.
Robert L. Bunch.
Chemical Engineering Progress, Symposium Series Vol 67, No 107, p 90-94, 1971. 3 tab, 33 ref.

Descriptors: *Biological treatment, *Phosphorou *Waste water treatment, Nutrients, Synthesi Sludge, Effluent, Algae, Secondary treatmen Biochemical oxygen demand, Chemical oxygen de mand, Carbon, Fertilization, Dissolved oxyge Sewage, Hydrogen ion concentration.
Identifiers: Suspended solids.

In ewecent years the phosphate content of wast water treatment plant effluents has been risin presumably traceable to the use of phosphates i detergents. Conventional biological treatment doe not effectively remove nutrients from waste wate The influence of an increased use of phosphate digester recycle, and imbalance of nutrients i waste water was recently studied. Phosphorou removal by synthesis can be higher than normal encountered if digester supernatant is not recycle and primary clarification is eliminated. Th elimination of these 2 practices will increase th carbon to phosphorous ratio, correcting th nutrient imbalance. If phosphorous is to b removed from waste water on a sustained basi then chemical or chemical-biological metho must be used and efforts must be continually mad to improve the dependability and applicability the biological process. (Gutierrez-Texas)
W71-12188

EFFECT OF DISSOLVED OXYGEN O PHOSPHOROUS REMOVAL IN MUNICIPA ACTIVATED SLUDGE TREATMENT,
Weston (Roy F.) Inc., West Chester, Pa.
W. F. Milbury, M. N. Bhatla, and V. T. Stack, Jr.
Chemical Engineering Progress, Symposium Serie Vol 67, No 107, p 100-106, 1971. 7 fig, 2 tab, 7 re

Descriptors: *Dissolved oxygen, *Phosphorous, *Activated sludge, Waste water transfer, Oxygen, Aeration, Hydrogen ion concentration, Turbidity, Effluents, Temperature, Sludge treatment, Waste water treatment.
Identifiers: Oxygen transfer, Clarifiers, Equalization.

Dissolved oxygen is an important parameter in conventional activated sludge treatment of municipal waste waters, and the presence of oxygen appears more critical when abnormal phosphorous removal is taking place without external chemical addition. The effect of dissolved oxygen was evaluated at an activated sludge plant at Baltimore, Maryland. A phosphorous release was stimulated when the dissolved oxygen concentration at the end of the aeration tank dropped below 2 mg/liter. A rapid phosphate release and recovery cycle was found to be reproducible on a daily basis. An effluent release of phosphorous was observed 6 hours after reducing aeration and total recovery was observed within 10 hours of resupply of adequate aeration. When a phosphorous release took place, some impairment of total carbon removal was observed, indicating oxygen-limiting conditions in the aeration tank. A laboratory batch test demonstrated normal phosphorous uptake when the dissolved oxygen level was maintained in the 0.4 to 0.8 mg/liter range. Full scale observations do not indicate that phosphorous removal is a function of D. O. concentration. The effect of D. O. on impairment of phosphorous removal appears only to take place when oxygen limiting conditions are present throughout the activated sludge aeration tank. (Gutierrez-Texas)
W71-12189

COMBINED BIOLOGICAL AND CHEMICAL TREATMENT FOR PHOSPHOROUS REMOVAL,
Michael L. Mulbarger, and Donald G. Shifflett.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 107-116, 1971. 13 fig, 2 tab, 19 ref.

Descriptors: *Biological treatment, *Phosphorous, *Waste water treatment, Activated sludge, Aluminum, Effluent, Filtration, Nitrification, Denitrification, Nutrients, Economics.
Identifiers: *Chemical treatment, Anaerobic, Influent, Suspended solids, Volatile solids.

The Manassas Field station, in an effort with the Federal Water Quality Administration and Prince William County, Virginia, has investigated advanced waste treatment technology oriented to upgrading municipal waste water treatment for nutrient removal. The purpose was to define considerations and limitations involved in combining chemical phosphorous removal with activated sludge treatment. Liquid alum and sodium aluminate were utilized for phosphorous removal at 1.0 and 0.2 mil. gal./day activated sludge municipal waste water treatment plants. Phosphorous removals were determined at aluminum to phosphorous ratios up to a limiting point exibiting a minimum total phosphorous residual of 1.0 mg/liter. Excessive effluent suspended solids were found to be more a function of volatile solids produced to aluminum added ratio than of exceeding a given aluminum to phosphorous ratio of aluminum dosage. The added chemical served as a weighting agent in the activated sludge and compensates for additional solids. Batch studies indicate that aluminum as alum will out-perform iron as ferric chloride on a performance/cost basis with the best point of addition being right before separation. (Gutierrez-Texas)
W71-12190

THE INTERRELATIONSHIP OF PHOSPHATE REMOVAL AND SOLIDS HANDLING IN THE ACTIVATED SLUDGE PROCESS,
Rex Chainbelt Inc., Mulwaukee, Wis.
William J. Katz, Anthony Geinopolos, and Donald G. Mason.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 122-127, 1971. 3 fig, 1 tab, 16 ref.

Descriptors: *Phosphorous, *Activated sludge, *Biological treatment, *Waste water treatment, Nutrients, Fertilization, Organic compounds, Primary treatment, Secondary treatment, Effluents, Dissolved oxygen, Sedimentation, Hydrogen ion concentration.
Identifiers: *Resolubilization, *Digester supernatant.

The fertilizing effect of phosphorous on lakes and rivers has become a significant problem. A major source of this fertilization is the effluents from waste treatment facilities. The removal of phosphorous from these effluents is highly desirable and in past years a requirement of 80% phosphorous removal has been superimposed on the waste treatment system. Biological, chemical and physical processes are recognized methods for the removal of phosphorous from waste waters. These methods include aerobic biological processes, ion exchange, electrodialysis, electrochemical treatment, chemical precipitation reverse osmosis and distillation. This paper, however, is concerned with the removal methods associated with primary and secondary treatment processes, specifically and activated sludge process. The waste treatment facility is divided into two subdivisions: the waste treatment system which produces a treated effluent and the sludge handling system which treats and disposes sludges. The activated sludge waste treatment removes phosphorous by synthesis and additional removals are simultaneously achieved by cationic precipitation. Flow sheets and data plots presented illustrate the process principles. (Gutierrez-Texas)
W71-12191

SECONDARY TREATMENT EFFICIENCY,
Robert L. Churchwell.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 128-130, 1971. 1 fig, 5 ref.

Descriptors: *Sewage treatment, *Oxygen, *Waste water treatment, Advanced waste treatment, Biochemical oxygen demand, Chemical oxygen demand, Organic wastes, Effluent, Primary treatment, Economics.
Identifiers: Dissolved organic carbon, Total oxygen demand.

The rising curve of organic loading has already intersected the available assimilative capacity of receiving water. In order to permit a healthy aquatic environment in spite of a continued population growth, all assimilative capacity will have to be reserved eventually for uncontrollable urban run-off, non biodegradable loading and a process approach to ideality. A unique approach to quantitate secondary waste treatment processes has potential for solving the mutual problems of pollution control agencies. Deficiencies of the antiquated BOD test are enumerated and need for assimilative capacity reservation is noted. Measurement of stoichiometric oxygen requirement of a waste water versus time in a bench scale reactor with an acclimated biota with a total carbon analyzer leads to a graph. Values are given to assess oxygen requirements desirable retention time, sludge production and efficiency. Supplemental needs for better quantitation include improved instrumentation and other parameters. (Gutierrez-Texas)
W71-12192

APPLICATION OF MICROBIOLOGY AND BIOENGINEERING PRINCIPLES TO BIOLOGICAL WASTE TREATMENT,
Biospherics Inc., Rockville, Md.
Gilbert V. Levin, and Obadiah P. Cohen.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 131-134, 1971. 1 tab, 44 ref.

Descriptors: *Microbiology, *Waste water treatment, *Biological treatment, Activated sludge, Microorganisms, Sewage, Aerobic, Biochemical oxygen demand, Oxidation, Effluent, Biodegradation, Aeration, Amino acids, Phosphates, Aerobic conditions.
Identifiers: Organic substrates.

A literature review was undertaken to determine factors in the aerobic treatment process which may limit the degree of biological treatment. The objective was to identify those limiting factors which might be controlled to improve performance in the sewage treatment plant in the hope of improving biological purification effectiveness and obviate or defer the need for tertiary physicochemical treatment stages. The scientific and engineering literatures relevant to aerobic sewage treatment were searched to identify factors limiting sewage treatment plant efficiency. A primary problem is the lack of knowledge concerning the identity of microbial species responsible for the biodegradation of sewage. Some of the factors limiting biological activity in the sewage treatment milieu are: (1) the fact that organic substrates are 1,000 times more dilute in sewage than in microbial growth media, (2) average temperature in sewage treatment aeration basins is significantly below the optimum for intestinal organisms, and (3) oxygen application rates may be as much as one order of magnitude below optimal. The need for automated chemical and biological assay equipment with feedback control over the sewage treatment process to apply limiting factor information is also essential for controlled treatment. (Gutierrez-Texas)
W71-12193

ECONOMIC EFFECT OF DESIGN VARIABLES TERTIARY WASTE WATER TREATMENT WITH GRANULAR ACTIVATED CARBON,
Kellogg (M.W.) Co., Piscataway, N.J.
A. E. Cover, and C. D. Wood.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 135-146, 1971. 4 fig, 8 tab, 2 ref.

Descriptors: *Activated carbon, *Tertiary treatment, Economics, *Waste water treatment, Biochemical oxygen demand, Chemical oxygen demand, Effluent, Velocity, Secondary treatment, Primary treatment, Adsorption.
Identifiers: *Regeneration, Carbon inventory.

Primary and secondary treatment together remove 90% BOD. This degree of treatment, however, is not adequate to meet all future clean water requirements. Tertiary waste water treatment with granular activated carbon is an efficient and reliable process for nearly complete organics removal. Two divisions of Pullman Incorporated, the M. W. Kellogg Company, and Swindell-Dressler Company under constract with the Federal Water Pollution Control Administration have been engaged in a review of an economic evaluation and engineering design of the granular carbon treatment process. The variables considered are plant size, velocity, contact time, carbon loss, capacity cost, type of contactor, number of contacting stages and certain combinations of the variables. Investments and operating costs have been presented for each case. (Gutierrez-Texas)
W71-12194

REMOVAL OF ORGANICS FROM WASTE WATER BY ACTIVATED CARBON,
Robert A. Taft Water Research Center, Cincinnati, Ohio; and the Sanitation District of Los Angeles County, Calif.
John N. English, Arthur N. Masse, Charles W. Carry, Jay B. Pitkin, and James E. Haskins.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 147-153, 1970. 10 fig, 4 tab.

Descriptors: *Activated carbon, *Waste water treatment, *Tertiary treatment, *Organic matter, Pilot plant, *Columns, Adsorption, Pressure, Dewatering, Filtration, Costs, Reclaimed water, Granules.

Identifiers: Thermal regeneration, Backwash, Series, Fixedtbed, Downflow.

A 0.3 million gal./day, four-stage, fixed-bed, granular activated carbon pilot plant, complete with thermal regeneration facilities, continuously treated unfiltered, activated sludge wastewater treatment plant effluent for a four-year period. High quality product water characterized by a COD of 10 mg./liter was produced on a routine basis. A 17% decrease in carbon capacity occurred between the first and fourth cycles (one cycle per year), at which time a steady state condition was established at a capacity between 45 to 50 lb. of dissolved COD per 100 lb. of carbon. Regeneration of the carbon was shown to be a feasible process and successful backwashing of the first stage carbon, which serves as a filter and an adsorber, made pretreatment of the waste water treatment plant effluent unnecessary. The estimated cost of $86 per million gallons, for a 10-million gal./day carbon plant is based on a fourth cycle dosage of 350 lb. of carbon per million gallons of water and a conservative carbon loss of 10% per cycle. (English-EPA)
W71-12195

THERMAL REGENERATION OF SPENT POWDERED CARBON USING FLUIDIZED-BED AND TRANSPORT REACTORS,
Federal Water Quality Administration, Cincinnati, Ohio.
Edward L. Berg, Roland V. Villiers, Arthur N. Masse, and Lawrence A. Winslow.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 154-164, 1971. 12 fig, 5 tab, 8 ref.

Descriptors: *Activated carbon, Activated sludge, Adsorption, Volatility, Economics, Temperature, Turbidity, Degradation, Centrifugation, Sedimentation, *Waste water treatment, Ohio.
Identifiers: *Thermal regeneration, Secondary effluent, Sewage chlorination, Total organic carbon, Lebanon (Ohio).

Adsorption on powdered activated carbon has been proven to be a feasible method for removing the bulk of the dissolved organic materials from a municipal secondary effluent. The cost of the carbon is such that it must be regenerated and re-used. A transport reactor and a fluidized bed regeneration furnace were evaluated at the Federal Water Quality Administration's Plant at Lebanon, Ohio regenerating carbon from a 10-gal./min adsorption system. The carbon was regenerated to near virgin capacity by both furnaces. Physical losses in both systems were near 15%. Operating difficulties with the transport reactor furnace led to the selection of the fluidized-bed furnace for further development. An economic analysis for a 10 mil.gal/day PCAS that includes regeneration, heat utilization, and centrifugation indicates a total cost of 11 cents/1000 gal of water treated. (Gutierrez-Texas)
W71-12196

APPLICATION OF CARBON TECHNIQUES TO BIOLOGICAL SYSTEMS,
Southwest Research Inst., San Antonio, Tex.
L. L. Hiser, and D. S. Tarazi.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 267-278, 1971. 7 fig, 4 tab, 8 ref.

Descriptors: *Carbon, *Biological treatment, Oxidation, Activated sludge, Hydrogen ion concentration, Chemical oxygen demand, Biochemical oxygen demand, Kinetics, Surface waters, Adsorption, Hydrogen Effluents, *Waste water treatment.
Identifiers: *Carbon analyzer, Aerobic mass, Total oxygen demand, Dissolved organic carbon, Suspended organic carbon.

Part of an in-house research project in carbon materials balance was conducted on a closed biological system. The conversion of dissolved organic carbon to carbon dioxide and suspended organic carbon (cell growth) was followed by monitoring all three phases, gas, liquid, and solid, of the closed system. A modified carbon analyzer was used for carbon determinations. An energy balance was made on the closed system by equating the oxygen equivalent of the carbon dioxide produced with the satisfaction of COD in the aqueous system. This approach was held valid for the carbohydrate substrate involved. An attempt was also made to obtain a volumetric oxygen balance. However, this attempt was unsuccessful owing to the loss of gas during the experiment and to the apparent production in the system of gases other than carbon dioxide. An approach is discussed for application of carbon and oxygen demand parameters to the control and monitoring of practical systems. (Gutierrez-Texas)
W71-12197

CALCIUM PHOSPHATE PRECIPITATION IN WASTE WATER TREATMENT,
Harvard Univ., Cambridge, Mass.
John F. Ferguson, David Jenkins, and Werner Stumm.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 279-287, 1971. 6 fig, 1 tab, 28 ref.

Descriptors: *Waste water treatment, *Primary treatment, *Chemical precipitation, Alkalinity, Kinetics, Solubility, Economics, Magnesium, Crystallization, Hydrogen ion concentration, Filtration, Precipitation, Flocculation, Centrifugation.
Identifiers: *Calcium phosphate precipitation, Secondary effluents, Lime treatment, Recarbonation.

The extensive testing of lime treatment for phosphate removal has demonstrated that the method is technically feasible and economically competitive with other schemes. The purpose was to provide some part of an understanding of this process through a discussion of the kinetics of calcium phosphate precipitation in a chemically defined system containing calcium, magnesium orthophosphate, hydrogen ion and water. A study was conducted on the chemistry of calcium phosphate precipitation in model systems designed to simulate waste water. Experimental results in the Ca-CO3-PO4 system showed that the effects of pH and the time of phosphate precipitation are complex. Below pH 9 induction periods exist that can be eliminated by addition of preciously formed precipitate. At pH 10 and 11, initially low soluble phosphate values increase to a constant value after 1 hour. Increasing carbonate concentrations slow the rate of phosphate precipitation and increases long-term phosphate residual. Magnesium, also slows the rate of phosphate precipitation at pH 8 and progressively decreases the phosphate residual after 5 hours. The kinetic and long-term data are also explained on the basis of competition between calcium carbonate and phosphate solids and the influence of pH and magnesium on these interactions. (Gutierrez-Texas)
W71-12198

REUSE OF SEWAGE WATER, A SOLUTION FOR TWO PROBLEMS: LACK OF WATER FOR INDUSTRY AND POLLUTION,
Celulosa y Derivados S.A., Monterrey (Mexico). Copropiedad Grupo Quimico.
Hector J. Gomez.
Chemical Engineering Progress Symposium Series, Vol 67, No 107, p 294-295, 1971. 1 tab.

Descriptors: *Waste water treatment, *Sewage, *Industrial water, *Water reuse, Irrigation, Sedimentation, Coagulation, Filtration, Chlorination, Demineralization, Activated sludge, Effluent, Mexico.
Identifiers: Celulosa, Derivados, *Monterrey (Mexico).

Industry in Monterrey, Mexico using the final effluent from the domestic waste water treatment plant, has solved the problem of lack of water, poor water facilities and contamination. At present there are 4 conventional activated sludge plants in Monterrey with flows of 1,600 gal/min. and a service industry treating 60% of the waste water. The plan has a capacity of 3 mil gal/day and effluent pumped into a lagoon with a capacity of 7.5 mi gal. After chlorination water goes into an ope basin. This water known as 'industrial water' is use for gardening, cleaning, fire systems, cooling an manufacturing. The waste water, also undergoe tertiary treatment and is then stored in enclose tanks to be pumped to where it is used, sometime up to 1.25 miles away. (Gutierrez-Texas)
W71-12199

PHOSPHATE REMOVAL BY FOAM FRAC TIONATION,
Garrett Research and Development Co., Inc., L Verne, Calif.
Donald E. Garrett.
Chemical Engineering Progress, Symposium Series Vol 67, No 107, p 296-303, 1971. 10 fig, 4 tab, ref.

Descriptors: *Phosphates, *Waste water treatment *Foam fractionation, Lime, Hydrogen ion concen tration, Economics, Algae, Solubility, Sewage Biochemical oxygen demand, Ion exchange Chemical oxygen demand, Fertilizer, Turbidity.
Identifiers: *Fractionation-flotation process.

A process has been developed by which air an water are contacted at high pressures, additives ar mixed with the solution, and very finely divide bubbles that are formed on the release of pressur are separated. The process also involves a com bination of a new variation of the foam fractiona tion process coupled with a precipitation step t allow effective removal of phosphates in an inex pensive and simple manner. The addition of iro and lime result in a complete, inexpensive separa tion of phosphate from the water to be treated. Th foam fractionation-flotation process is more tha competitive with conventional treatment scheme The foaming process offers the advantage o requiring less land than conventional treatment which is a significant factor in land-short areas i helping alleviate difficult phosphate remova problems. Its greatest advantages are its simplicit and high removal efficiency for all the contami nants, COD, turbidity, and phosphates. Flowsheet and economic evaluations of the process were als discussed in this paper. (Gutierrez-Texas)
W71-12200

PHOSPHOROUS REMOVAL FROM WASTE WATER BY ACTIVATED ALUMINA COLUMNS,
Battelle-Northwest, Richland, Wash.
Gordon L. Culp, and Lloyd L. Ames, Jr.
Chemical Engineering Progress Symposium Series Vol 67, No 107, p 304-309, 1971. 8 fig, 2 tab, 2 ref

Descriptors: *Phosphorous, *Waste water treatment, Economics, *Adsorption, Effluent Hydrogen ion concentration, Limes, Sewage Secondary treatment, Costs.
Identifiers: *Alumina columns, Recirculation Sodium hydroxide, Regeneration, Influent.

Alumina, a phosphorous selective adsorbent wa used in a tertiary chemical process for phosphorou removal from waste water. The process was scale up from laboratory size to a 25 gal/min mobile pilo plant. The pilot plant was designed to fit a standar 40 ft. van trailer. Secondary effluent was passe through a multimedia filter bed and stored in an ex terior 2,500 gal. surge tank of collapsible plasti From this tank, filtered sewage was pumped t columns containing 150-160 gal of alumina. Afte phosphorous loading an alumina column was take off the line and 800 gal of 1 M NaOH was used t remove the adsorbed acid by recirculation. Colum washing following the elution cycle was pH co trolled. Used NaOH was pumped from the causti makeup tank to the mixing tank and lime added t precipitate phosphorous in the form of soli hydroxlapatite. The solids were removed in a co tinuous centrifuge and the NaOH returned to th

makeup tank for reuse. Initial operating costs for the study were 5.8 cents/1000 gal. Operation of an alumina pilot plant in several geographic locations would be desirable to determine the effects of influent composition, and other operating conditions, on process performance and economics. (Gutierrez-Texas)
W71-12201

LIME PRECIPITATION IN MUNICIPAL WASTE WATERS,
John B. Stamberg, Dolioff F. Bishop, Paul H. Warner, and Samuel H. Griggs.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 310-320, 1971. 16 fig, 1 tab, 19 ref.

Descriptors: *Waste water treatment, *Biological treatment, Aeration, Chemical precipitation, Filtration, Turbidity, Flocculation, Phosphorous, pH, Effluent, Sedimentation, Bacteria, Nutrients, Alkalinity, Municipal water.
Identifiers: *Lime precipitation, Biological oxidation, Insolubilization, Biological denitrification, Organic-free solution, Recarbonation.

The objectives were to establish the distribution of particulate and soluble components during lime precipitation for a wide pH range and to determine effects of various waste water characteristics on the process. Liming of treated waste water to pH 10 insolubilized forms of phosphorous in waste water, but removals to residuals of 0.3 mg/liter occurred only above pH 11.5, where precipitated magnesium hydroxide flocculated turbidity. Nitrification of the waste water during biochemical treatment reduced the lime requirement for precipitation, the amounts of sludge from precipitation and improved phosphorous removals. Liming of organic free solutions precipitated mixtures of ortho and polyphosphates by pH 10, while insolubilization of meta or tripolyphosphate required a pH above 11. A conclusion to this study was that the degree of biochemical oxidation significantly influences phosphorous removals, while temperature and ionic strength do not. (Gutierrez-Texas)
W71-12202

PERFORMANCE OF SURFACE-AERATED BASINS,
Fluor Corp., Los Angeles, Calif.
Milton R. Beychok.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 322-339, 1971. 6 fig, 3 tab, 26 ref.

Descriptors: *Biological treatment, *Waste water treatment, *Oxidation, Activated sludge, Biochemical oxygen demand, Effluent, *Aeration, Temperature.
Identifiers: *Surface aeration, *Biological oxidation, Microbial sludge, Oxygen transfer, Influent.

Most biological oxidation processes for stabilizing biologically degradable wastes use oxygen and microbial action. The various processes range from low-rate natural oxidation lagoons to high-rate activated sludge units and surface-aerated basins occupying intermediate positions. In relation to these processes the American Institute of Chemical Engineers, water committee undertook a program to collect and evaluate aerated basin performance data with the objective of developing correlations which might be useful in designing surface-aerated basins. BOD removal rates were correlated against influent waste water BOD concentrations and removal rate coefficients derived from the correlations were obtained from 2 different waste water species. The main variables considered were temperature, retention time, BOD concentration, aeration levels, and mixing power input. Series versus parallel flow configurations were discussed and analyzed. (Gutierrez-Texas)
W71-12203

ULTIMATE DISPOSAL OF BRINES FROM MUNICIPAL WASTE WATER RENOVATION,
Burns and Roe Inc., Oradell, N.J.
P. M. Rapier.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p. 340-351, 1971. 9 fig, 12 tab, 22 ref.

Descriptors: *Waste water treatment, *Brines, Economics, *Water reuse, Desalination, Ion exchange, Reverse osmosis, Electrodialysis, Geological surveys, Effluent, Filtration, Evaporation, Permeability, Municipal water.
Identifiers: Land dumping, Total dissolved solids, El Paso (Texas), Tucson (Ariz), Denver (Colo).

Many areas in the western portion of the United States are characterized by arid conditions, with resulting shortages of water supply. As a consequence water must be reused, which can cause the destruction of land by build-up of sodium salt at the surface. This problem is usually solved by modern desalination methods operating on municipal waste water. For water sources below 2,000 mg/liter 3 processes show good potential for desalination: ion exchange, reverse osmosis, and electrodialysis. However, these 3 processes produce large volumes of dilute waste brine, containing contaminants removed in rendering the municipal effluent suitable for multiple reuse. The cost of the disposal of brines from a hypothetical municipal water renovation was investigated for El Paso, Texas, Tucson, Arizona, and Denver, Colorado. These sites were chosen because they represented different climatic and geological regions in the more water-short regions in the United States. Disposal methods considered were evaporating ponds, deep wells, pipelines and distillation. The costs of disposal depended on climate and location. Costs were highest at Denver where geology ruled out deep wells and net evaporation rates were low. (Gutierrez-Texas)
W71-12204

JOINT TREATMENT OF CHROME TANNERY WASTES AND MUNICIPAL SEWAGE,
Camp, Dresser, McKee, Boston, Mass.
Robert H. Culver.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 352-362, 1971. 9 fig, 10 tab, 7 ref.

Descriptors: *Waste water treatment, *Chromium, Sewage treatment, Biochemical oxygen demand, Aeration, Alkalinity, Activated sludge, Biological treatment, Hydrogen ion concentration, Effluent, Sulfides, Proteins, Flocculation.
Identifiers: *Chrome tanning wastes, *Tannery wastes, Carbonation-sedimentation, Total volatile solids, Aeration, Pickling, Clarifier, Suspended solids.

A waste treatment process was developed and tested in pilot plant scale for the treatment of tannery wastes in combination with municipal sewage. Design factors for the various steps were developed. Studies were made of the fundamental systems and reactions which form the basis for the process employed in the pilot plant. The results of investigations made on processes lead to 5 major conclusions: (1) waste water from a chrome tannery can be treated successfully by standard sewage treatment processes if mixed with a sufficient quantity of sanitary sewage, (2) 3 units required for successful treatment of tannery wastes by the activated sludge process consist of an equalization basin, an aeration basin, and chlorination facilities, (3) sludge dewatering can be achieved by a solid bowl centrifuge attaining a force of 1,300 x gravity, (4) tri-valent chromium concentrations up to 100 mg/liter have little effect on the efficiency of the activated sludge process, and (5) sulfides in tannery wastes are biologically oxidized. (Gutierrez-Texas)
W71-12205

WATER POLLUTION CONTROL AT PHILLIPS PUERTO RICO PETROCHEMICAL COMPLEX,
Phillips Puerto Rico Core Inc., Guayama.
Luis O. Figueroa.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 377-379, 1971. 1 fig, 1 tab.

Descriptors: *Water pollution control, *Sewage treatment, Freshwater, *Waste water treatment, Primary treatment, Aeration, Biochemical oxygen demand, Dissolved oxygen, Oxidation, Effluent, Industrial wastes, *Water demand, Puerto Rico.
Identifiers: Static waters, Sewer systems, Biological solids, Equalization, Clarifiers.

Phillips Puerto Rico Core Inc, and Fibers International are initial facilities involved in petro-chemical processes. These plants require 2,300 gal/min of freshwater. The addition of an estimated agricultural irrigation requirement of 3,500 gal/min holds the total demand of the aquifer to 5,800 gal/min. Recent studies and process changes have brought the demand below 5,500 gal/min increasing the well water available. Rainwater falling in the Core plant area flows to a 2,000,000 gal. baffled storm pond. This pond guarantees treatment for dumps, spills and washdown waters that enter the rainwater drain systems. The plant laboratory pollution control section provides an accurate picture of plant conditions. Facilities installed at Core plant and Fibers have proved to be positively adequate to maintain effective control of water pollution and as established are flexible for future plants and expansions. (Gutierrez-Texas)
W71-12206

OPTIMIZING A KRAFT MILL WATER REUSE SYSTEM,
Texas Univ., Austin.
David N. Lyons, and Wesley W. Eckenfelder, Jr.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 381-387, 1971. 11 fig, 3 tab, 16 ref.

Descriptors: *Pulp wastes, *Mathematical models, *Optimization, *Water reuse, *Waste water treatment, Biological treatment, Activated sludge, Freshwater, Filtration, Adsorption, Effluent, Biochemical oxygen demand, Chemical oxygen demand, Lime treatment, Carbon, Costs, Industrial wastes.
Identifiers: *By-product recovery, *Decolorization, Influent, Biological system, Suspended solids, Total dissolved solids, Chemical coagulation.

In determining the optimum quality of water recovery and reuse a generalized mathematical model was developed. The model and associated methodology were applied to the water management system of a medium size bleached kraft pulp mill. Through the optimization of this problem, the reuse of water reclaimed from industrial waste water was accomplished by utilizing the mathematical model developed. The cost solution considered the effects of variations in production process water quality requirements, cost and quality of freshwater and reclaimed water and the cost of effluent treatment. The application of the model to the pulp and paper mill indicated that high levels of recycle could be economically justified if stringent color standards for waste water effluents required a high degree of biological treatment. The key to the process of reclaiming usable water from the pulp and paper mill was color removal. (Gutierrez-Texas)
W71-12207

SQUIBB SOLVES ITS PHARMACEUTICAL WASTE WATER PROBLEMS IN PUERTO RICO,
Weston (Roy F.), Inc., West Chester Pa.
Ronald J. Lawson, Michael L. Woldman, and Paul P. Eggerman.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 401-404, 1971. 3 fig, 1 tab.

Descriptors: Water conservation, *Waste water treatment, *Stabilization, Fermentation, Crystallization, Distillation, Filtration, *Biological treatment, Toxicity, Biochemical oxygen demand, Chemical oxygen demand, Sludge, Effluent, Nutrients, Puerto Rico, Industrial wastes.
Identifiers: *Oxygen transfer, Hydrolysis, Solvent washing, Solvent recovery, Equalization, Humacao (Puerto Rico).

E. R. Squibb and Sons Inc., has contracted with Jacobs Engineering Company to design and construct 2 pharmaceutical plants at the same location in Humacao, Puerto Rico. Major production steps involved at the plant will include hydrolysis, solvent washings and recovery, crystallization, distillation and filtration. A number of extensive treatability studies were conducted to develop process design parameters and establish reliability of biological treatment of synthesized dilute process waste waters. Laboratory biological treatability investigations were undertaken to obtain essential design parameters for an aerated stabilization process. The basic laboratory program included development of an accliminated biological sludge in a continuous flow system. Interpretation of continuous data from the biological systems showed that one of the two waste waters had a removal rate twice as fast as the other. The gross sludge production calculated from the tests was 1.02 lb of volatile suspended solids/lb of BOD removal with a sludge destruction rate of 21% of the volatile suspended solids/day. This new design and construction has created a more sophisticated treatment facility that will dispose of more than 99% of the influent organic contamination. (Gutierrez-Texas)
W71-12208

TAHOE AND WINDHOEK: PROMISE AND PROOF OF CLEAN WATER,
Envirotech Corp., Palo Alto, Calif.
Frank P. Sebastian.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 410-412, 1971. 8 ref.

Descriptors: *Water reuse, *Waste water treatment, *Tertiary treatment, *Sewage treatment, Economics, Purification, Chemical oxygen demand, Biochemical oxygen demand, Effluent, Activated carbon, Hydrogen ion concentration, Calcium hydroxide, Fertilizer, Costs, California.
Identifiers: *Lime sludge, Algae flotation, Clarifiers, Lake Tahoe (Calif), Windhoek (SW Africa).

Technical and economic achievements in water reclamation have been demonstrated in full-scale operations at Lake Tahoe, California, and Windhoek, South West Africa. At these locations it has been shown that sewage effluent can be safely treated to produce drinking quality water. The plant at Tahoe consists of a conventional activated sludge plant with an added tertiary system. A significant step in compatibility of thermal reclamation processes used at Tahoe is the development of exhaust gas cleaning devices that cool and clean the gases so effectively that particulate matter is unmeasureable. In the first years of operation the effluent was better than the standards set, the median BOD was 0.98 mg/liter and the median COD was 10.83 mg/liter. The total operating cost of the tertiary process based on 7.5 million gal/day is 14 cents/1000 gal. and the amortization cost is 8.75 cents/1000 gal, while the incremental cost above secondary treatment is 1.5 cent/person/day. During trial runs undertaken to study the overall performance of the plant, test work included a determination of the fate of polio viruses, bacteria, and parasites. Tests showed little or no viruses were present passing into the chlorination tank, giving no indication as to the effectiveness of the levels of chlorine used. As a result of the tests it was shown that completely acceptable water could be produced from specified sewage effluents. (Gutierrez-Texas)
W71-12209

ECONOMICS OF REGIONAL WASTE TRANSPORT AND DISPOSAL SYSTEMS,
Bechtel Inc., San Francisco, Calif.
For primary bibliographic entry see Field 05E.
W71-12210

TREATMENT OF WASTE OIL: WASTE WATER MIXTURES,
Armco Environmental Engineering, Middletown, Ohio.
John E. Barker, Verlin W. Fultz, and Ronald J. Thompson.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 423-427, 1971. 3 fig, 3 tab.

Descriptors: *Oil wastes, *Waste water treatment, *Coagulation, *Steel, Adsorption, Distillation, *Flocculation, Effluent, Turbidity, Hydrogen ion concentration, Economics, Chemical oxygen demand, Sludge, Industrial wastes.
Identifiers: *Oil pollution, *Chemical emulsion, Agglomeration, Rinse waters, Air flotation, *Chemical coagulation, Incineration.

An improved chemical coagulation process for treating cold mill rinse waters was developed by the Armco Research Laboratories. A facility was designed and constructed to apply a coagulation process to the wastes from a new 5-stand tandem cold mill. Experimental studies at Armco resulted in the development of a 4-chemical coagulant process requiring relatively small amounts of coagulant and resulting in a sludge high in oil content. The basic design of the treatment system is a 2-step approach: (1) removal of free and emulsified oil by chemical coagulation, flocculation, and dissolved air flotation and (2) separated oil scum receives treatment of heating, mixing and settling for removal of solids and waters. The operation of the system is controlled by visual observations, pH, and turbidity. Efficient turbidity is used as an overall measure of treatment efficiency. Over a 7 month period the plant has averaged 91% removal of total oil; 89% removal of COD, and an effluent turbidity of 35 Jackson Turbidity Units. Tests indicate that the recovered oil has sufficient heat content to support its own combustion at temperatures in excess of 2,400F. Air pollution can be a problem if adequate equipment is not provided for control of particulates such as aluminum oxide and clay. (Gutierrez-Texas)
W71-12211

THE USE OF THE INTEGRATED WASTE TREATMENT APPROACH IN THE LARGE ELECTROPLATING SHOP,
Williams (S. K.) Co., Wauwatosa, Wis.
William P. McDonough, and F. A. Steward.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 428-431, 1971. 8 fig.

Descriptors: *Waste water treatment, *Chlorination, Oxidation, Toxicity, Effluent, Hydrogen ion concentration, Sewage, Sludge, Industrial wastes.
Identifiers: *Integrated Treatment Systems, Cyanide, Chronic acid, Rinse water, *Electroplating wastes.

A plant constructed by the S.K. Williams Company involves operations of cleaning, descaling and electroplating, all of which produce different types of toxic chemical compounds in the water. To maintain rinse water purity, the Lancy Integrated Treatment System was used. At present there are 5 systems in operation: (1) integrated cyanide treatment treats cyanide complexes, (2) integrated chromium I system treats chromic acid wastes containing high concentrations of free chromic acid, (3) integrated chromium II system treats chromic acid wastes containing low concentrations of free chromic acid, (4) integrated nickel system treats nickel from sulfate, chloride and chelated complexes on plastics, and (5) integrated copper system treats copper from acid complexes. The integrated treatment systems were chosen for the following reasons: (1) treated contaminant before entering water, (2) provided most efficient use of materials used to treat toxic compounds, (3) equipment used was not expensive and (4) operation of the system is simple. With the use of this system the rinse waters do not become contaminated, thus the effluent is suitable for reuse. At present 70-85% of the total water flow is reused. An additional benefit of the system is that it eliminates the need for equipment to handle large volumes of effluent. (Gutierrez-Texas)
W71-12212

RECONDITIONING FOOD PROCESSING BRINES WITH ACTIVATED CARBON,
Western Research Lab. National Canners Association, Berkeley, Calif.
Walter A. Mercer, Jack W. Ralls, and Harry J. Maagdenberg.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 435-438, 1971. 8 fig, 3 tab.

Descriptors: *Salinity, *Activated carbon, *Waste water treatment, *Brines, Economics, Sodium chloride, Aeration, Biochemical oxygen demand, Chemical oxygen demand, Acidity, Effluent, Hydrogen ion concentration, California.
Identifiers: *Regeneration, Influent, Suspended solids, Food processing wastes.

Exploratory work done at Albany, California Laboratory of the U. S. Department of Agriculture investigated the reconditioning of spent olive storage brines on a commercial scale and evaluation of their reuse potential. A pilot plant scale brine reconditioning unit was constructed and used at 4 olive canneries in the central valley of California. At each of the 4 locations, substantial volumes of spent storage brine were put through carbon columns. The influent feed rate varied from 0.5 to 3.5 gal/min corresponding to 0.36 to 2.5 gal/min. sq. ft. of carbon area. The extent of treatment of the brine was followed by measuring COD, suspended solids, pH, acidity, and color transmission. Six additions of 60 lb. portions of fresh carbon were added to each of the brines, causing significant changes. The effluent was essentially transparent to light of 425 micron wavelength until 6,000 gal of brine contacted a charge of 1,000 lb of activated carbon: transmittance decreased beyond the 6,000 gal point to 75% at 10,000 gal of collected effluent. The results showed that pH, acidity, salt content and suspended solids do not change much on carbon treatment, but COD and color change significantly. The results of these tests showed the reconditioning and reuse of olive storage brines to be a commercially feasible process and that the increment in cost was a relatively small figure. (Gutierrez-Texas)
W71-12213

METAL FINISHING WASTE TREATMENT AIMS ACCOMPLISHED BY PROCESS CHANGES,
Lancy Labs., Inc., Zelienople, Pa.
Leslie E. Lancy.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 439-441, 1971. 1 fig.

Descriptors: *Waste water treatment, *Copper, *Oxidation, Temperature, Precipitation, Neutralization, Sodium sulfate, Hydrogen ion concentration, Sludge, Economics, Effluent, New Jersey, Industrial wastes.
Identifiers: *Chemical treatment, *Recrystallization, Curpous alloy, Cupric oxide, Sulfuric acid, Electrolytic system, Zinc, *Metal finishing wastes.

The Volvo Brass and Copper company has employed an 'afterpickle: for cuprous oxide dust removal,' consisting of sulfuric-chromic acid and ammonium bifluoride chromic acid formulations. The problem as far as strict waste treatment requirements are concerned is the difficulty in clarifying the effluent so it meets esthetic requirements and carries low levels of suspended solids of metallic origin. Sludge concentration and sludge drying or filtration are also serious problems. An investigation of the system showed that electrolytic

recovery of copper in an economical manner was possible, provided the current density for electrolysis was kept in a low range. The cupric sulfate formed in the pickling process could be periodically removed by simple crystallization and cupric sulfate crystals could be added to the electrolytic copper recovery system or could be sold separately as a by-product. Total effluent water discharged is 10 gal/min and the waste water is suitable for reuse by rinsing purposes back into the process, maintaining the dissolved solids level in a suitable concentration. (Gutierrez-Texas)
W71-12214

HYDROXIDE PRECIPITATION AND RECOVERY OF CERTAIN METALLIC IONS FROM WASTE WATERS,
American Enka Corp., Enka, N.C.
David M. Rock.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 442-444, 1971. 4 ref.

Descriptors: *Lime, Chemical precipitation, Filtration, Sludge, Flocculation, Effluents, *Waste water treatment, Toxicity, Hydrogen ion concentration, Iron, Economics, Textiles, Industrial wastes.
Identifiers: *Cathanodic treatment, *Viscose rayon, Clarifiers, *Zinc wastes, Neutralization, By-product recovery, Metallic ions.

The American Enka Corporation has developed a unique industrial scale process for the precipitation of metal hydroxides, specifically using zinc wastes from one of its viscose rayon plants. In 1968 the Federal Water Quality Administration offered American Enka Corporation a Research and Development Grant to complete development of this process. An acid waste collection system was constructed to collect the zinc bearing wastes at their source before they became diluted with plant waste water. An acid resistant rotary vacuum belt filter was also provided to filter impurities in the recovered final zinc sulfate solution before its reuse in the rayon plants. While using only caustic soda for neutralization the process has operated for 4 months and the recovered zinc has been reused in a rayon plant spinning process for a similar period. The final sludge contains 1% of magnesium hydroxide and 0.05-0.10% of iron as an impurity. The degree of economy of the process depends on the sulfuric acid to zinc sulfate ratio in the feed to the recovery plant. The process has proved to be successful for large scale production of metal hydroxide sludges of high density and ease of handling and disposal. It could also, be used to neutralize acid mine waters and to precipitate their toxic mineral content. (Gutierrez-Texas)
W71-12215

MULTISTAGE BIOLOGICAL OXIDATION COLUMNS FOR CHEMICAL WASTES,
Monsanto Biodize Systems Inc., Great Neck, N.Y.
G. L. Knowles, Jr.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 445-450, 1971. 10 fig, 1 tab, 4 ref.

Descriptors: *Biological treatment, *Oxidation, *Sewage treatment, *Waste water treatment, Dissolved oxygen, Biochemical oxygen demand, Trickling filters, Effluent, Nitrogen, Phosphorous, Hydrogen ion concentration, Activated sludge.
Identifiers: *Aerators, *Chemical waste treatment, Clarifier, Neutralization, Equalization.

Frequency recurring patterns of circumstances in chemical waste treatment are high and variable concentrations, variable composition, intermittent or interruptible flow and shortage of space. A successful approach to dealing with such situations is utilizing staged oxidation columns with special plastic packaging. Monsanto Inc., is presently constructing a full scale plant dealing with this problem. The initial plan is to provide storage and primary treatment, discharging it to the municipal sewage system. Some of the primary objective of the full-scale design, involved investigations determining: (1) whether BOD removal was dependent on BOD concentration, (2) whether BOD removal varied as waste changed from day to day and (3) whether columns could be operated in series, obtaining the required BOD removal. A six-stage plant was designed with a provision for recycle, containing a decantation step for removal of toulene and mineral spirits, pH adjustment, equalization or surge storage for 2.0 mil gal. Prototype plant operations on the site have shown that: (1) waste stream BOD content was high, (2) activated sludge could not be relied on, since biological mass does not coagulate and settle, (3) oxidational columns operating in series gave BOD removal of 4,000 lb BOD/day, and (4) the plant removes a total of 90% BOD or 29,000 lb/day from 1.4 mil. gal/day of waste water, occupying only 1.8 acres of land. (Gutierrez-Texas)
W71-12216

A NEW CONCEPT FOR THE BIOLOGICAL TREATMENT OF TEXTILE FINISHING WASTES,
Fram Corp., East Providence, R.I.
Clarke A. Rodman, and Edward L. Shunney.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 451-457, 1971. 10 fig, 3 tab, 2 ref.

Descriptors: *Biological treatment, *Textiles, *Waste water treatment, Biodegradation, Adsorption, Trickling filters, Chemical oxygen demand, Biochemical oxygen demand, Activated carbon, Effluent, Waste water, Activated sludge, Hydrogen ion concentration, Microorganisms, Industrial wastes.
Identifiers: *Bio-regeneration cycles, Textile wastes, Carbon granules, Bio-oxidize, Total organic carbon.

Biological treatment of waste water can be markedly improved by providing myriads of solid surfaces upon which biological growth is accelerated. Field studies of a sorption-biological regeneration treatment process were conducted by Masland and Sons Inc., at Wakefield, Rhode Island. The waste used was a colored water solution of 50,000 gal/day over a 10 hour dyeing period. A 10 hour adsorption filtration phase followed a 14 hour biological regeneration phase without providing a duplicate 24 hour service. The Masland-Wakefield Plant's effluent averages 700 mg/liter COD at a flow of 50,000 gal/day and removes 300 lb COD/day. The prime function of the treatment plant is to remove color to a light or indistinguishable level when diluted with tidal basin water. A secondary function is the removal of biodegradable matter. The Masland-Wakefield Plant has operated successfully in excess of 14 times the adsorption capacity of the activated carbon employed. The effluent has a great potential as a color breakthrough. (Gutierrez-Texas)
W71-12217

LIME PRECIPITATION FOR COLOR REMOVAL IN TERTIARY TREATMENT OF KRAFT MILL EFFLUENT AT THE INTERSTATE PAPER CORPORATION, RICEBOROUGH, GEORGIA,
Interstate Paper Corp., Riceborough, Ga.
Charles L. Davis, Jr.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 458-465, 1971. 5 fig, 8 ref.

Descriptors: *Biological treatment, *Aeration, Waste water treatment, Chemical precipitation, Chemical oxygen demand, Dissolved oxygen, Hydrogen ion concentration, Economics, Alkalinity, Effluent, Flocculation, Turbidity, Georgia, Pulp wastes.
Identifiers: *Lime treatment, Chemical treatment, Liberty County (Geo), Color removal process, State requirements.

A report was presented on the case history of environmental control at Interstate Paper Corporation's Kraft Linearboard Mill, following the concepts and results of 2 years operation. The mill is designed for a rated capacity of 400 tons of unbleached kraft linearboard/day with process water requirements of 12,500 gal/ton and a BOD of 25 lb/ton. A lime coagulation process is used for the removal of color from the process waste combined with primary clarification followed by natural biochemical stabilizations. Lime treatment has reduced 46% of COD and 34% of BOD5. The color removal system in the tertiary treatment process operates successfully under varying conditions giving a relatively consistent waste color in the range of 125 ppm of APHA color units at treatment levels of 1,000 ppm of calcium hydroxide with untreated waste colors in the range of 1,200 ppm. At this level of treatment the lime costs are $53.73/mil.ga. with 90% chemical lime at $15.35/ton. Other advantages of the color removal process are: (1) preconditions effluents for biochemical degradation; (2) eliminates foaming; (3) reduces phosphorous concentration; (4) prevents eutrophication; (5) high alkalinity provides sterilization, and (6) separate treatment for domestic sewage is not required. (Gutierrez-Texas)
W71-12218

ADSORPTION/FILTRATION: A NEW UNIT PROCESS FOR THE TREATMENT OF INDUSTRIAL WASTE WATERS,
Calgon Corp., Pittsburgh, Pa.
J. L. Rizzo.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 466-470, 1971. 2 fig, 5 tab, 5 ref.

Descriptors: *Adsorption, *Filtration, Coagulation, *Waste water treatment, *Water reuse, Economics, Activated carbon, Biochemical oxygen demand, Chemical oxygen demand, Effluents, Isotherms, Industrial wastes.
Identifiers: Influent, Suspended solids, Total oxygen content.

Adsorption is one of the newer processes for organic waste water treatment. As a unit process it offers many advantages when compared to biological processes: (1) treats wastewater to a quality suitable for reuse, (2) requires 1.43% land required for a biological process, (3) handles toxic wastes, (4) no secondary sewage is produced, (5) has esthetically superior water, (6) lower capital investments and (7) recovers valuable by-products from waste water. Three basic adsorption systems utilized for pollution control or water reclamation are: (1) the fixed bed system, (2) moving bed system, and (3) parallel systems. Adsorption is an economical unit process having numerous advantages over conventional biological organic removal processes. Technology has developed granular activated carbon for adsorption of dissolved organics. The adsorption of these organics should be evaluated for treatment of many industrial waste waters. (Gutierrez-Texas)
W71-12219

TEXTILE WASTE TREATMENT, TODAY AND TOMORROW,
Clemson Univ., S.C.
John J. Porter, William F. Nolan, and Ray A. Abernathy.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 471-478, 1971. 5 fig, 29 ref.

Descriptors: *Textiles, *Biological treatment, *Waste water treatment, *Biodegradation, Pollution, Effluent, Biochemical oxygen demand, Hydrogen ion concentration, Detergents, Oxidation, Cotton.
Identifiers: *Emulsion, *Polyvinyl alcohol, *Carboxymethal cellulose, Dye, Suspended solids, Homogeneous, Heterogenous, Electrolyte removal.

Chemicals and fibers used by the textile industry are changing each year. Fibers, sizing chemicals and finishes, at one time biodegradation are now resistant to microbial degradation. Biological degradation occurs in natural fibers when the fiber

is retained with the sludge in the treatment plant. This is not true for most synthetic fibers, as they are comparatively inert. The build-up of synthetic fibers in a treatment plant using mechanical aeration can cause damage to pumps and aerators, unless fibers are removed from the waste-stream before entering the plant. To evaluate the efficiency of any waste treatment an organic carbon analyses should be run on the influent and effluent streams. A complete description of the quality of waste water treatment can be obtained by studies of BOD, pH, and dissolved solids. Two important considerations for construction of a waste treatment plant are the cost and availability of land. In the future, waste streams will be isolated and treated by physical, chemical or biological methods, dependent on the composition of the stream. (Gutierrez-Texas)
W71-12220

VERSATILE METHODS OF WASTE WATER TREATMENT,
Catalytic Inc., Washington, D.C.
John A. Hufnagel.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 479-484, 1971. 7 ref.

Descriptors: *Waste water treatment, *Activated sludge, Chemical oxygen demand, Biochemical oxygen demand, Trickling filters, Flash distillation, Reverse osmosis, Ion exchange, Effluent, Secondary, Tertiary, Electrodialysis, Nutrients, Oil wastes.
Identifiers: *Physical-chemical treatment, Suspended solids, *Carbon.

Physical processes to treat water have only recently been developed into unit operations. The 3 most promising candidates for physical treatment of water are carbon adsorption of pollutants, flash distillation of water, and reverse osmosis. Carbon adsorption is probably the most advanced of the physical treatment processes. FWQA reports that an activated carbon plant can treat waste water having 60 mg/liter COD and reduce it to 7.0 mg/liter in a plant handling 10,000,000 gal/day for about 13.7 cents/1000 gal. A second physical process for treatment of waste water is by reverse osmosis, whose benefit is that the permeate is free of bacteria and much of the salt is eliminated from the permeate. A third alternative is the waste treatment plant serving a multiple city of industries. This type of plant has proved to be cheaper to operate, maintain, and capatilize than a single installation serving a plant. In the future the concept to total water reuse will stimulate a complex serving several production facilities. The physical methods of treatment of all kinds of waste waters are possible and may provide a solution to clean up of the water and total reuse. (Gutierrez-Texas)
W71-12221

PILOT DEMONSTRATION OF BASIC DESIGNS FOR ANAEROBIC TREATMENT OF PETROCHEMICAL WASTES,
Union Carbide Corp., South Charleston, W. Va.
John A. Fisher, Joseph C. Hovious, Gordon W. Kumke, and Richard A. Conway.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 485-494, 1971. 13 fig, 7 tab, 13 ref.

Descriptors: *Waste water treatment, *Oil wastes, *Economic feasibility, *Anaerobic conditions, Aerobic, Sulfides, Oxidation lagoons, Wetting agents, Chemical oxygen demand, Biochemical oxygen demand, Toxicity, Fermentation, Flocculation, Effluent, Activated sludge.
Identifiers: *Anaerobic respiration, *Contact reactor, Solids retention time, Hydraulic retention time, Chlorbacteriaceae thiorhodaceae, Beggiatoa, Thiobacillus, Suspended solids, Influent.

In order to increase the scope of study on anaerobic system and to develop and disseminate information in a form useful to others, a research grant was awarded by the Federal Water Quality Administration for partial support of in-depth anaerobic treatment studies by Union Carbide. Anaerobic filters and lagoons operating at low microorganism concentrations were used. An anaerobic lagoon experiment was performed at Union Carbide's Texas City Plant utilizing actual waste streams. 50 gal. units were used to treat concentrated wastes of 15,000 mg/liter COD at detention times of 20-40 days. The experiments conducted in the study showed that the anaerobic lagoon provided an economical method for decreasing oxygen demand of petrochemical waste waters by about 40-60% at loadings less than 10 lb. COD/1000 cu ft./day. The lagoon is also uniquely suitable for utilizing sulfates found in petrochemical wastewaters providing organic reduction by a sulfur reduction oxidation cycle. The capital and operating costs of the system are significantly low. (Gutierrez-Texas)
W71-12222

TREATMENT OF WASTEWATER RESULTING FROM THE PRODUCTION OF POLYHYDRIC ORGANIC COMPOUNDS,
Dow Chemical Co., Freeport, Tex.
M. A. Zeitoun, W. F. McLlhenny, and W. A. Taber.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 495-503, 1971. 18 fig, 2 tab, 4 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Activated sludge, Effluent, *Organic wastes, Economics, Chemical oxygen demand, Biochemical oxygen demand, Aeration, *Oxidation, Hydrogen ion concentration, Microorganisms, Fermentation, Alkaline hydrolysis, Algae blooms, Utah, Great Salt Lake, Organic compounds, Brines.
Identifiers: Fusarium No 83, Bacterium No 52, Endogenous respiration, Total oxygen demand, Glycols.

Under a grant from the Federal Water Quality Administration a development program was undertaken to investigate the treatment of waste waters resulting from the production of polyhydric organic compounds. The Dow Chemical Company as the recipient of the grant has subcontracted with Texas A and M University for support of investigations on biological oxidation of organic compounds. Four overall objectives were set up: (1) to develop a method of treatment of wastes from a polyhydric manufacturing processes; (2) examine several alternative treatment methods; (3) determine technical, engineering and economic feasibility, and (4) develop sufficient information for the conceptual design of a waste treatment facility. A biological oxidation procedure using an activated sludge technique has been able to reduce organic contents of sodium chloride brines to acceptable levels. A pilot facility operating on full strength wastes has been designed and is being used to obtain design information for a large scale waste control unit. The program involved is presently still underway. (Gutierrez-Texas)
W71-12223

IN PLANT MODIFICATIONS FOR REDUCTION OF NITROGENOUS POLLUTIONAL INPUT TO FERTILIZE PLANT EFFLUENT,
Farmer's Chemical Association, Inc. Chattanooga, Tenn.
Edward C. Bingham, Carl E. Adams, Jr., and Peter A. Krenkel.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 504-513, 1971. 20 fig, 1 ref.

Descriptors: *Waste water treatment, *Ammonia, *Nitrates, Economics, Effluent, Evaporation, Chemical oxygen demand, pH, Micro-organisms, Anaerobic, Toxicity, Osmosis, Phosphorous, Organic matter, Fertilizers, Nitrification, Denitrification.
Identifiers: *Drier, Pre-drier, Chromate, Air-stripping, Ion exchange.

The Farmer's Chemical Association was awarded a research and development grant by the Federal Water Quality Administration to investigate and develop methods of treating large concentrations of nitrogenous substances. Various methods were investigated to recover, remove or reduce the nitrogenous load into the plant waste stream. These methods included many types of biological, chemical and physical treatment schemes, including: (1) biological nitrification, (2) biological dentrification, (3) air stripping of ammonia, (4) recovery of ammonium and (5) precipitation of ammonia as magnesium ammonium phosphates. Of the various methods investigated the most prominent recovery scheme was the concurrent, moving bed, continuous flow ion exchange process. While the most effective treatment schemes seem to be biological dentrification and ammonia precipitation by the addition of phosphate and magnesium. The pollutional abatement program undertaken at FCAI resulted in several major observations: (1) prior to developing a treatment scheme, all processes producing waste streams should be examined. (2) prospect of product recovery should be evaluated thoroughly and (3) each individual source of waste should be thoroughly examined and characterized in order that the most efficient treatment scheme be developed. (Gutierrez-Texas)
W71-12224

STUDY AND DESIGN OF SECONDARY TREATMENT FACILITIES FOR A POLYVINYL CHLORIDE PRODUCTION PLANT,
Goodrich (B. F.) Chemical Co., Cleveland, Ohio.
W. C. Holbrook, and J. C. Lank.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 514-530, 1971. 7 fig, 9 tab, 12 ref.

Descriptors: *Biological treatment, *Activated sludge, *Waste water treatment, *Sewage treatment, Phosphorous, Suspension, Emulsions, Aeration, Turbidity, Toxicity, Biochemical oxygen demand, Chemical oxygen demand, Effluent, Coagulation, Hydrogen ion concentration, Filtration, Adsorption, Flocculation, Oxygen, Industrial wastes.
Identifiers: *Polyvinyl, *Polymerization, Polyelectrolyte.

In 1966 the B. F. Goodrich Chemical Company initiated plans to construct a polyvinyl chloride manufacturing facility. The facility would employ emulsion, suspension and bulk polymerization processes, and would generate waste waters containing monomers, polymers, organic and inorganic salts, organic acids, resins and fine rubber solids, dispersants, wetting agents, and catalyst. The waste water volume for the new plant was established at 800,000 gal/day, and a water usage per pound 20% less than the lowest usage figures for similar processes. Activated carbon adsorption tests were also conducted on chemically clarified wastes. The tests indicated that the adsorption capacity was poor due to water soluble, long chain organic soaps in the wastes. It was concluded that activated carbon treatment was not a practical or economical method of achieving secondary treatment. At this point it was apparent that a completely mixed activated sludge process would have to be utilized. A secondary clarifier was designed such that the sludge would settle to 1% consistency, resulting in a design overflow rate of 565 gal/day/sq.ft and a detention time of 3 hours. Chemical and biological sludge compaction levels were established at 8 and 2% consistency. (Gutierrez-Tx)
W71-12225

TREATMENT OF CITRUS PROCESSING WASTE WATER INCLUDING EFFLUENT NUTRIENT CONTROL,
Environmental Engineering, Inc., Gainesville, Fla.
Richard H. Jones.
Chemical Engineering Progress, Symposium Series Vol 67, No 107, p 531-535, 1971. 4 fig, 1 ref.

Descriptors: *Waste water treatment, Effluent Biochemical oxygen demand, Phosphorous *Nutrients, Aeration, *Activated sludge, Foaming Nitrogen, Hydrogen ion concentration, Florida.

Identifiers: *Lime treatment, Influent, Cattle feed, *Citrus processing wastes.

Winter Garden Citrus Products Co-operatives, one of the largest citrus processing plants in the country, was cited by the Florida Department of Air and Water Pollution Control for discharging untreated waste water into Lake Apopka. Environmental Engineering Inc. was retained as consulting engineers and were given 6 weeks to develop an acceptable waste treatment method, including effluent nutrient control. Tests were made on the treatment of concentrated citrus waste water by the complete mixed activated sludge process. Results from this research showed that concentrated citrus waste could be effectively treated by the process. Laboratory tests also showed that lime treatment of biologically treated effluent resulted in an effluent low in suspended solids and phosphorous. Based upon the tests made a full-scale treatment plant was designed and constructed. Plant design was based on a flow of 2 mil gal/day and a BOD of 2,000 mg/liter. Aeration was provided by 4-75 hp mechanical surface aerators in each of the 2 aeration tanks. The maximum and minimum flows were 1.9 and 0.0 mil gal/day, while BOD concentrations were 4,250 and 144 mg/liter. Effluent from the treatment plant was successfully reused. Continuous reuse was limited to barometric leg water, although plant effluent was used as cooling water. (Gutierrez-Texas)
W71-12226

PHOSPHOROUS REMOVAL: A CONTROLLABLE PROCESS,
Dow Chemical Co., Midland, Mich.
Ronald G. Schuessler.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 536-540, 1971. 9 fig, 3 tab.

Descriptors: *Phosphates, *Waste water treatment, *Adsorption, Precipitation, Sewage, Effluent, Hydrogen ion concentration, Alkalinity, Economic feasibility, *Flocculation, Filtration.
Identifiers: Metallic salts, Polyelectrolyte, Acid digestion, Metals.

In 1966 the Dow Chemical Company instituted a research and development program to develop a phosphorous removal process compatible with the activated sludge and trickling filter processes. A chemical approach following a two-step process was selected: (1) conversion of soluble phosphates into an insoluble suspended form with metallic salts, and (2) flocculation of the suspended phosphate forms and other solids with organic polyelectrolyte. To determine the feasibility of phosphorous removal by chemical precipitation systems, Dow conducted a series of laboratory and plant scale tests, the results indicated that a system of ferric chloride at 15 mg Fe..3/litter and 0.3 mg purifloc A-23, anionic polyelectrolyte was the most economical system for the plant. Following the feasibility study, the city of Grand Rapids, Michigan made application to the Federal Water Quality Administration for funds to study application of the process to their 45 million gal/day activated sludge waste water treatment plant. Preliminary results indicate that greater than 90% total phosphorous removal is being achieved at Grand Rapids. The Dow Chemical Company has developed a chemical precipitation phosphorous removal process that combines the features of automatic, electronic process control, highly effective total phosphorous removal, improved unit process operations relatively low cost and predictable process efficiency. (Gutierrez-Texas)
W71-12227

EXPANDED-BED ADSORPTION FOR TREATMENT OF SEWAGE EFFLUENTS,
FMC Corp., Princeton, N.J.
Walter J. Weber, Jr., Charles B. Hopkins, and Ralph Bloom, Jr.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 541-553, 1971. 18 fig, 4 tab, 20 ref.

Descriptors: *Sewage treatment, *Adsorption, Economics, Effluents, Activated carbon, Chemical oxygen demand, Biochemical oxygen demand, Phosphates, Turbidity, *Waste water treatment, Load distribution.
Identifiers: *Total organic carbon, *Soluble organic carbon, *Suspended solids, Bed-flow.

Under contract with the Federal Water Quality Administration through the Advanced Waste Treatment Research Laboratory, expanded bed adsorbers were evaluated on a pilot plant scale for treating secondary effluent and settled sewage. The purpose of the work was to determine if the potential operating advantages of expanded bed adsorbers over packed bed adsorbers, for treating effluents which contain suspended solids, could be achieved without sacrificing the effectiveness of carbon adsorption. To achieve expanded-bed operation, the water treated was passed upward through a bed of activated carbon at velocities expanding the bed by 15% of its volume at rest. By this process, solids, organic matter, and phosphates can be removed at a cost 30-40% below that for primary and secondary treatments, while achieving the same results. Secondary effluent treatment tests in parallel expanded-bed, and packed-bed systems were carried out for 100 days. Total throughput was 314,000 gal for the expanded-bed system and 307,000 gal. for the packed-bed system. The greatest difference in operation between the systems was the necessity of frequent cleaning of the former system due to clogging and buildup of excessive head losses. The results of the pilot scale studies indicated that the expanded-bed mode of carbon contacting can be used effectively in treatment of primary or secondary effluent. The expanded-bed adsorbers demonstrated the advantage of requiring little cleaning and maintaining a constant pressure drop under all conditions. (Gutierrez-Texas)
W71-12228

A NOVEL AEROBIC AIR-LIFT AERATION PROCESS FOR STANDARD SECONDARY TREATMENT PLANTS,
Massachusetts Inst. of Tech., Cambridge; and Dynatech, Cambridge, Mass.
D. L. Wise, D. I. C. Wang, and H. A. Racicot.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 554-557, 1971. 2 fig.

Descriptors: *Aeration, *Sewage treatment, Waste water treatment, Biochemical oxygen demand, *Fermentation, Microorganisms, *Biological treatment, Compressibility.
Identifiers: *Aerobic air lift, *Oxygen transfer, Oxygen efficiency.

The main idea involved in large scale fermentation work is the use of the 'air-lift' concept, which has recently been successfully modified and adapted to large fermenters envisioned for protein production from hydrocarbons. The spin off from this large store on research effort can be used for improved processing in biological waste treatment. Experimental work has showed that a key design parameter for the fermenter is that the ratio of the cross-sectional area of the draft tube to the annulus cross-section by unity. This design parameter may be achieved by providing more than one draft tube in a large tank or channel. The British Petroleum Company is presently using the air-lift concept in its full scale protein from hydrocarbon production plant at La Vere, France. Conventional secondary waste treatment is a fermentation process. The air-lift concept offers a way of combining known principles to increase air to liquid mass transfer rates that have treatment significance in the waste treatment field, but does not add to the economic burden of mechanical aerations. (Gutierrez-Texas)
W71-12229

ECONOMIC COMPARISON OF U-TUBE AERATION WITH OTHER METHODS FOR AERATING WASTE WATER,
North American Rockwell Corp., Canoga Park, Calif. Rocketdyne Div.
Rex C. Mitchell, and Abraham D. Lev.
Chemical Engineering Progress Symposium Series, Vol 67, No 107, p 558-565, 1971. 7 fig, 7 tab, 12 ref.

Descriptors: *Aeration, *Waste water treatment, Mass transfer, Economics, Sewage, Solubility, Oxygen, Flexibility, Compressibility.
Identifiers: *U-tube, Transfer efficiency, Fluid dynamics, Diffuser.

An interesting technique used for meeting the requirements for aerating water is the 'U-Tube' concept. The system basically consists of 2 elements: (1) device for entraining air into a flowing water stream and (2) vertical u-shape flow paths providing residence time in a zone above atmospheric pressure where oxygen absorption can take place. Experimental data was obtained to characterize the mass transfer and fluid dynamics behavior of a representative prototype u-tube system over large ranges of design variables and operating conditions. It was found that the u-tube technique is a partical, efficient method for aeration. There is ample flexibility in the choice of u-tube configurations plus other design variables to permit efficient, specific designs for a variety of applications and requirements. U-tube systems require little space and maintenance, no operating labor, can be designed with no moving parts, and result in substantial cost savings over conventional aeration methods. Mechanical and diffused aeration systems are not readily comparable, except for individual cases. (Gutierrez-Texas)
W71-12230

WHY NOT DEEP AERATION TANKS,
Mixing Equipment Co., Rochester, N.Y.
J. Y. Oldshue.
Chemical Engineering Progress Symposium Series, Vol 67, No 107, p 566-567, 1970. 2 fig, 1 tab.

Descriptors: *Aeration, Absorption, Economics, Organic matter, Ammonia, Velocity, Oxygen, *Waste water treatment.
Identifiers: *Aerators, Stripping, Horsepower.

Submerged turbine-type aerators have been used in high and low rate aeration processes for many years, usually with a maximum water depth of 16 ft. Surface aerators or a submerged turbine aerator have been used for typical low rate aeration processes. When using submerged turbine aerators with a separate gas introduction tanks of any depth or desired uptake rate may be considered. In general, there are several combinations of air supply horsepower and mixer horsepower that will accomplish the same uptake rate, however, equal uptake rate, horsepower levels, and gas velocities are difficult to maintain when two different scales are used. Mixing impellers have also been used for absorption of gases, including enriched air, oxygen, hydrogen, ammonia, and sparlingly soluble organics, although the maximum impeller zone fluid shear stress is normally less in pilot-scale than in full-scale. Several techniques were presented in the article to carry out different experiments studying various scale down parameters. (Gutierrez-Texas)
W71-12231

DESIGN CONSIDERATIONS FOR TREATMENT OF SOLIDS-LADEN WASTE WATERS BY REVERSE OSMOSIS,
Environgenics Co., El Monte, Calif.
Donald L. Feuerstein, and Taras A. Bursztynsky.
Chemical Engineering Progress Symposium Series, Vol 67, No 107, p 568-574, 1970. 9 fig, 2 tab, 1 ref.

Descriptors: *Waste water treatment, *Reverse osmosis, *Sewage treatment, Pollutants, Economic feasibility, Osmosis, Carbon, Membranes, Turbulence, Flocculation.
Identifiers: Water flux, Operating pressure, Undissolved solids.

Reverse osmosis for renovation and reclamation of waste waters could replace several traditional unit processes, due to its ability to effect high removals

of waste water constituents. The critical factor establishing economic feasibility is the maintenance of acceptable produce water flux over an extended period of time, minimizing installed membrane surface area and replacement occurrence. Basic elements of the reverse osmosis process consist of the membrane, a means for providing high pressure differential across the membranes, and a support for the membrane against this differential process. An important operating variable is the produce water recovery ratio. The highest recovery at which the process can be operated is dependent on 3 factors: (1) concentration of low solubility inorganic compounds and organic substances in the feed water may be limiting, (2) water quality deteriorates as recovery ratios are increased 90-100%, (3) in highly saline waters, the osmotic pressure of concentrating brine at large recovery ratios approaches maximum obtainable pressure of the reverse osmosis unit. In application of this process to the treatment of waste waters particular attention is given the deposition of finely dispersed solids on the membrane surface and the associated reduction in long-term produce water flux. Research and development programs underway are establishing the role of waste water constituents in the performance of reverse osmosis processes and developing means of overcoming undesirable effects and improving performance. (Gutierrez-Texas)
W71-12232

NEW ION EXCHANGE SYSTEMS FOR TREATING MUNICIPAL AND DOMESTIC WASTE EFFLUENTS,
Rohm and Haas Co., Philadelphia, Pa.
Robert Kunin, and Donald G. Downing.
Chemical Engineering Progress Symposium Series, Vol 67, No 107, p 575-580, 1971. 5 fig, 7 tab, 3 ref.

Descriptors: *Ion-exchange, *Waste water treatment, Separation techniques, Resins, Effluent, Evaporation, Desalination, Freezing, Membranes.
Identifiers: *Deionization technique, Anion, Cation, Rinse-waters, Influent.

Rohm and Haas recently developed a new deionization technique (DESAL) process based on the use of 2 weak electrolyte ion exchange resins, for treating brackish waters on an economical basis. Employing ion exchange, economically for desalination of brackish waters requires anion and cation exchange resins. Certain requirements must be met for the process to be economical: (1) exchangers must regenerate theoretical efficiencies with low cost acids and bases, (2) ion exchange resins must operate at high capacities and resins must be freed of waste regenerants with a minimum of water, and (3) waste regenerants should pose a minimal waste disposal problem. The DESAL process is based on weakly basic anion exchange structures forming bicarbonate salts with solutions of carbon dioxide and having favorable chloride-bicarbonate selectivity coefficients. The key factor in the process is the unusual characteristic of the weak base anion exchange resin. There has been one commercial installation of the DESAL process in the United States that has been working satisfactorily, treating brackish water of 1,000 PPM, producing a final effluent in the range of 20-30 PPM. Modifications of the process can treat acid mine drainage waters, industrial waste effluents, and sewage waste effluents. Economic analysis of acid mine drainage through the DESAL process was about $0.30/1000 gal/1000 PPM removal. A modified DESAL process for renovation of secondary sewage effluents offers a significant technological breakthrough as a means of processing sewage effluent waters and rendering them suitable for either industrial, agricultural or domestic use. (Gutierrez-Texas)
W71-12233

ENGINEERING RESEARCH FOR IMPROVING BIOLOGICAL TREATMENT PLANTS,
G. V. Levin, O. P. Cohen, and G. J. Topol.
Chemical Engineering Progress, Symposium Series, Vol 67, No 107, p 581-584, 1971. 2 fig, 2 tab, 5 ref.

Descriptors: *Sewage treatment, *Activated sludge, Economic feasibility, *Aeration, Biochemical oxygen demand, Phosphates, Nutrients, Microorganisms, Effluents, Adsorption, *Biological treatment, *Waste water treatment.
Identifiers: Substrates, Mixed liquor.

An interesting insight into sewage treatment mechanisms is revealed in a comparison of the activated sludge process and the trickling filter process. The former process removes up to 90% of the influent BOD while the trickling filter process effects 60-75% BOD removal. The rate of BOD reduction in the trickling filter exceeds that of the activated sludge process in which 4-8 hours of aeration are required to achieve ultimate effectiveness. Important factors responsible for the observed differences in the two processes are the extensive surface areas available to microorganisms on the trickling filter rocks, and nutrients concentrated by adsorption, promoting biological activity. It is the purpose of a new process proposed to combine the advantages of activated sludge and trickling filter treatments, accomplishing high degrees of sewage treatment in short treatment times. The new process adds finely divided material to the aeration basin in an aeration treatment process, providing suitable surface area for the development of microbial colonies. Studies were performed on 12 different types of coal as possible materials for the new process. There are numerous materials, other than coal which are suitable for use in the process. These include glass, plastics, ceramics, and a variety of natural and synthetic products. The new process has a potential for improving BOD phosphates, and solids removal, and reducing required capacities of the return sludge line, aeration basin, and final clarifier. (Gutierrez-Texas)
W71-12234

THE BIO-DISC PROCESS: NEW TECHNOLOGY FOR THE TREATMENT OF BIODEGRADABLE INDUSTRIAL WASTE WATER,
Ronald L. Antonie.
Chemical Engineering Progress Symposium Series; Vol 67, No 107, p 585-588, 1971. 3 fig, 4 tab, 4 ref.

Descriptors: *Waste water treatment, Treatment facilities, *Biodegradation, Tertiary treatment, Economics, Chemical reactions, Heat transfer, *Biomass, Fermentation process, Microorganisms, Industrial wastes.
Identifiers: Liquid extractions, Gas absorption.

The bio-disc system consists of a series of closely spaced disks mounted on a horizontal shaft and rotated while partially immersed in waste water. Rotation of the discs alternately passes the biomass through waste water and air. The treated waste water carries sloghed materials to a subsequent clarification step for separation and disposal. Operating in this manner the rotating disks perform 3 primary functions: (1) to provide the media for the support of a mixed microbial growth, (2) contact growth with waste water, and (3) aerate waste water to provide the dissolved oxygen necessary to maintain aerobic biological activity. The bio-disc process achieved a high degree of treatment on a variety of industrial wastes and a wide range of BOD concentrations. The process has been shown to exhibit very stable operation under varying waste water flow patterns, including hydraulic surges and intermittent flow. The bio-disc process lends itself well to modular fabrication and installation, thus reducing capital costs. The process has removal capacity, very low operating and maintenance costs and its constitution features strongly favor its application to many waste water treatment problems. (Gutierrez-Texas)
W71-12235

CAGED LAYER PERFORMANCE IN PENS WITH OXIDATION DITCHES AND LIQUID MANURE STORAGE TANKS,
Guelph Univ. (Ontario). Dept. of Poultry Science.
J. P. Walker, H. L. Orr, and J. Pos.
Poultry Science, Vol 50, No 2, March 1971, p 501-505. 1 tab, 4 ref.

Descriptors: *Poultry, *Oxidation lagoons, *Confinement pens, *Performance, Waste disposal, Farm wastes, Waste treatment, Storage tanks, Slurries, Aeration, Equipment, Nitrogen, Odor, Design criteria.
Identifiers: Liquid manure, Egg production, Egg quality, Anti-foaming agent.

The increased size of poultry operations and the spread of urban areas has created problems in the disposal or utilization of poultry waste. These have been aggravated by the increased use of the liquid system of manure handling and its resultant odors. The purpose of this study was to evaluate the performance of caged layers housed in a pen utilizing oxidation ditches in contrast to caged layers housed in a pen with anaerobic liquid storage tanks. The conclusion is that hen housed egg production, egg quality, feed conversion and mortality performance of caged layers in pens with oxidation ditches was similar to that of caged layers in pens with liquid manure storage tanks. The odor in the pen with the oxidation ditches was less offensive than in pens with anaerobic liquid manure tanks. Modifications must be developed for oxidation ditches or other more economical means developed for oxidizing liquid poultry manure before it has practical application. (Hazen-Iowa State University)
W71-12236

REMOVAL OF PLANT NUTRIENTS BY MEANS OF AEROBIC STABILIZATION OF SLUDGE,
Illinois Univ., Urbana. Dept. of Microbiology; and Illinois Univ, Urbana. Dept. of Agricultural Engineering.
Roar L. Irgens, and H. Orin Halvorson.
Applied Microbiology, Vol 13, No 3, May 1965, p 373-386. 16 fig, 8 tab, 8 ref.

Descriptors: Chemical Oxygen Demand, *Biochemical Oxygen Demand, *Waste water treatment, *Sludge treatment, Sludge digestion, Denitrification, *Nutrients.
Identifiers: Digester supernatant fluid, Kjeldahl nitrogen.

In the convential treatment of sewage, the solids are normally disposed of by anaerobic digestion. This leaves a considerable amount of plant nutrients, such as nitrogen and phosphate, as soluble compounds which will eventually find their way into the plant's final effluent, since the supernatant fluid from the digesters is normally returned to the raw sewage. In a recent investigation, we found that, if the sludges were treated by an aerobic process, a significant portion of the carbonaceous matter was oxidized to carbon dioxide and water, and the rest was assimilated into microbial protoplasm. This process tied up the available nitrogen and phosphorus so that practically none remained dissolved in the suspending liquid. The accumulated solids, consisting mostly of microbial cells were separated very easily from the liquid leaving a slightly colored supernatant fluid that was water-clear, free from plant nutrients, and very low in BOD and COD. The overall process was accomplished in a detention time not exceeding 20 days, in contrast to anaerobic digestion which requires from 50 to 70 days. (Hazen-Iowa State University)
W71-12238

WASTE HANDLING: WHAT ARE THE CHOICES,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
O. I. Berge.
Hoard's Dairyman, Vol 116, March 25, 1971, p 353, 383. 1 fig.

Descriptors: *Farm wastes, *Waste water treatment, Waste disposal, Waste storage, Cattle, Odor, Fertilizers, Value.
Identifiers: *Waste handling, Waste utilization.

Waste disposal has long been a problem. Wastes must be removed periodically for good sanitation. For dairymen, the three major alternatives for handling manure are daily spreading, stockpiling for

spreading when field conditions are more favorable, and liquid storage with spreading under more desirable conditions. All three systems depend on the availability of land for spreading within a reasonable distance of the cattle barn. No system of manure handling has been devised which is not likely to offend the nostrils of sensitive people. (Hazen-Iowa State University)
W71-12239

ANAEROBIC DIGESTION OF FARM ANIMAL WASTES (DAIRY BULL, SWINE AND POULTRY),
Wisconsin Univ., Madison. Dept. of Civil Engineering; and Wisconsin Univ, Madison. Dept. of Agricultural Engineering.
Lorne C. Gramms, L. B. Polkowski, and Stanley A. Witzel.
Transactions of the ASAE, Vol 14, No 1, January-February 1971, p 7-11, 13. 10 fig, 4 tab, 7 ref.

Descriptors: *Anaerobic digestion, *Farm wastes, *Digestion, Laboratory tests, Sludge, *Chemical Oxygen Demand, Poultry, Cattle, Gases, Hydrogen ion concentration, Alkalinity, Settling velocity.
Identifiers: Volatile solids reduction, Gas production, Volatile acids, Dentition time.

Dairy bull, swine, and pultry wastes are amenable to anaerobic digestion. Anaerobic digests for dairy bull waste may be loaded at rates of 0.24 pound VS per cubic foot per day with detention times between 10 to 15 days for good reduction in volatile solids and COD. Anaerobic digesters for pultry waste should not be loaded at rates greater than 0.18 pound VS per cubic foot per day with detention times between 10 to 15 days. Although substantial reductions may be achieved in volatile solids, and COD, the ultimate disposal of the wastes would still be a problem. If long term anaerobic digestion were used it would allow storage until the sludge could be spread on the land to obtain the optimum fertilizer value for land management. Of the three wastes studied the specific resistance of the poultry waste was the only value that was similar to the specific resistance of anaerobically digested domestic sludge. (Hazen-Iowa State University)
W71-12240

GROWTH OF MICROORGANISMS IN FRESH CHICKEN MANURE UNDER AEROBIC AND ANAEROBIC CONDITIONS,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering; and Kentucky Univ., Lexington. Dept. of Animal Science.
Sally W. Jackson, B. E. Langlois, and T. H. Johnson.
Poultry Science, Vol 49, No 6, 1970, p 1749-1750. 1 fig, 5 ref.

Descriptors: *Feeds, *Farm wastes, Poultry, *Aerobic conditions, Bacteria, Microorganisms, Laboratory tests, *Anaerobic conditions, Disposal.
Identifiers: Waste re-use, Uric acid, Ruminant feeds.

Utilization of animal manure as feed not only would provide a new source of protein for animals, but also would help to reduce the pollution of the environment. While use of such material as feed is not permitted at this time, research is necessary in order to determine the feasibility of using manure as feed in the event it is made legal. This study was made to determine whether microorganisms contained in chicken manure could utilize constituents of the fresh manure and increase in number during aerobic or anaerobic fermentation. Results suggested that fresh chicken manure contains substrates capable of supporting aerobic but not anaerobic growth of bacteria. (Hazen-Iowa State University)
W71-12242

WASTE MANAGEMENT...WHAT DOES IT COST,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
Orrin I. Berge.
Hoard's Dairyman, Vol 116, April 10, 1971, p 420. 8 tab.

Descriptors: *Waste disposal, *Cost comparisons, *Farm wastes, Cattle, *Costs, Cost analysis, Annual costs, Capital investment, Fertilizers, Value.
Identifiers: Cost factors.

This article is an economic protection of the cost factors involved in handling wastes by daily hauling, stacking or liquid manure. Daily hauling requires the least investment and liquid manure systems the most. The annual costs for each of the systems are much closer than the investment figures. The cost of the waste handling systems may be offset to a considerable extent by the fertility value of the wastes. (Hazen-Iowa State University)
W71-12244

5E. Ultimate Disposal of Wastes

FREEL V OZARK-MAHONING CO (DAMAGES RESULTING FROM STREAM POLLUTION).
For primary bibliographic entry see Field 06E.
W71-11657

WASTE DISPOSAL AND TREATMENT IN PERMAFROST AREAS - A BIBLIOGRAPHY.
Department of Interior, Washington, D.C. Office of Library Services.
For primary bibliographic entry see Field 10.
W71-11789

FLUID BED INCINERATION OF PETROLEUM REFINERY WASTES.
American Oil Co., Mandan, N.D. Mandan Refinery.
For primary bibliographic entry see Field 05D.
W71-11794

THE 50-MILE BALLAST-OIL DUMPING PROHIBITED ZONE OF ALASKA RECONSIDERED IN THE LIGHT OF AVAILABLE DATA GLEANED FROM SIGNIFICANT INCIDENTS,
Federal Water Quality Administration, Corvallis, Oreg. Pacific Northwest Water Lab.
For primary bibliographic entry see Field 05G.
W71-11796

MODERN METHODS OF DISPOSAL OF SLUDGE,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05D.
W71-12051

POLLUTION CONTROL AND MANAGEMENT.
Charles River Associates, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 05G.
W71-12063

SOLID WASTE DISPOSAL,
For primary bibliographic entry see Field 05G.
W71-12160

EFFECTS OF MARINE SEWAGE DISPOSAL,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05C.
W71-12180

ULTIMATE DISPOSAL OF BRINES FROM MUNICIPAL WASTE WATER RENOVATION,
Burns and Roe Inc., Oradell, N.J.
For primary bibliographic entry see Field 05D.
W71-12204

ECONOMICS OF REGIONAL WASTE TRANSPORT AND DISPOSAL SYSTEMS,
Bechtel Inc., San Francisco, Calif.
T. L. Tompson, P. E. Snoek, and E. J. Wasp.
Chemical Engineering Progress, Symposium Series, Vol 67, No. 107, p 413-422, 1971. 9 fig, 6 tab, 3 ref.

Descriptors: *Waste water treatment, *Land reclamation, *Sludge disposal, Waste disposal, *Economics, Dredgings, Sludge, Fertilizer, Nutrients, Sewage, Coagulation.
Identifiers: *Waste transport, *Municipal reuse, Phosphorous removal.

A study was sponsored by the Federal Water Quality Administration determining the technical feasibility and economics of transporting sewage treatment plant sludge and other selected wastes by available transport systems for land and ocean disposal. The general region selected wastes by available transport systems for land and ocean disposal. The general region selected for studying land disposal was the great lakes megalopolis extending from Buffalo to Milwaukee, while ocean disposal was investigated along the Atlantic Coast megalopolis from Boston to Norfolk. Evaluation of regional sludge transport and disposal systems were taken of the Northeast Ohio area. An area evaluation displayed the ultimate disposal system as being a 12 in. pipeline extending from the Cleveland area southerly to Harrison County. For developing the economics of ocean disposal the cases of a 5-mile outfall to shelf waters (60 ft. depth) and an 80 mile outfall to the edge of the continental shelf (650 ft depth) were evaluated. The ocean disposal system would have 2 pipeline collection branches mainlining from an 18 in. diameter line. In conclusion utilization of long distance pipelines can extend the radius of potential sites by hundreds of miles. Two major points mentioned were (1) land reclamation and upgrading of marginal lands with digested sludge is an economical and ecological desirable method of sludge disposal, and (2) pipelines offer low costs means of transporting wastes to areas where they can be used in an environmentally beneficial manner at rates of $1.60/ton/25 mi. (Gutierrez-Texas)
W71-12210

MANURE STACKING.

Hoard's Dairyman, Vol 115, October 1970, p 1028, 1067. 3 fig.

Descriptors: *Waste disposal, *Waste dumps, *Waste storage, *Farm wastes, Management, Equipment.
Identifiers: Waste storage facilities.

The expense and problems involved with hauling wastes daily and the cost of liquid waste systems have caused agricultural engineers and dairy farmers to consider other ways of handling farm wastes, one of which is stacking. Unlike liquid waste systems, the amount of water that is mixed with the manure must be kept to a minimum. Another problem that may result with stacking is that of runoff from the stack itself. There is not the odor problem that exists in liquid systems. There are a number of stackers on the market; as it appears more dairymen will switch to stacking as a disposal system. (Hazen-Iowa State University)
W71-12243

5F. Water Treatment and Quality Alteration

METHODS OF REMOVING NITRATES FROM WATER,
Interagency Agricultural Waste Water Treatment Center, Firebaugh, Calif.
For primary bibliographic entry see Field 05C.
W71-11698

BLACK SEA MICROORGANISMS GROWING ON HYDROCARBONS,
Institute of Biology of Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 05A.
W71-11712

MOVEMENT OF BACTERIA FROM A RIVER TO A MUNICIPAL WELL--A CASE HISTORY,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 05B.
W71-11716

POLAROGRAPHIC OXYGEN ANALYZER RESPONSE: THE EFFECT OF INSTRUMENT LAG IN THE NON-STEADY STATE REAERATION TEST,
Washington Univ., Seattle. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05A.
W71-11846

INVESTIGATION OF TECHNIQUES ELIMINATING CANCEROGENIC, AROMATIC, POLYCYCLIC COMPOUNDS BY WATER TREATMENT WITH EMPHASIS ON OZONE, (Untersuchungen zur Eliminierung kanzerogener, aromatischer Polyzyklen in der Trinkwasseraufbereitung unter besonderer Berucksichtigung des Ozons),
J. Reichert.
Gas und Wasserfach, Vol. 110, No. 18, p 477-482, May 2, 1969. 1 fig, 4 tab, 109 ref.

Descriptors: *Ozone, Pollution, Ground water, Surface waters, Water pollution treatment.
Identifiers: Carcinogens, Polycyclic compounds.

Increasing pollution of ground-, and surface waters with solids makes elimination of cancerogenic, polycyclic compounds a necessity. Investigation of ozone treatment showed that benzopyrene concentration between 1 and 100 mg/liter was eliminated in 99 percent by treatment during 30 min with between 0.5 and 1.5 mg/liter of ozone. (In German) (McCann-Battelle)
W71-11852

MERCURY IN THE ENVIRONMENT.
For primary bibliographic entry see Field 05B.
W71-11878

FREQUENCY DISTRIBUTIONS OF THE CHEMICAL AND PHYSICAL CHARACTERISTICS OF POTABLE WATER,
Reading Univ., Whiteknights, Dept. of Applied Physical Sciences Reading Univ. (England). Dept. of Applied Physical Sciences.
R. Ainsworth.
Water and Water Engineering, Vol 74, No 897, p 467, November 1970. 1 fig, 1 tab.

Descriptors: *Potable water, *Water quality control, *Statistical methods, Hardness (Water), Calcium, Carbonates, Magnesium, Sodium, Potassium, Iron, Nitrates, Chlorides, Sulfates, Fluorides, Silica, Carbon dioxide, Nitrogen, Hydrogen ion concentration, Conductivity.

Studies of water-related subjects such as corrosion, scale deposition, and water treatment rely on a knowledge of characteristics of water such as ion concentrations, pH, and conductivity. To provide better data for these studies, the author sampled and analyzed potable water for some of these parameters from the main sources of 70 of the largest water undertakings in Great Britain. The results were treated statistically to show the frequency of occurrence of given values of the characteristics. The 10 and 90 percentile and mean values were also calculated. (Sample values are included.) Use of these values should improve the results obtained in related studies. (Little-Battelle)
W71-11911

METHODS FOR THE DETERMINATION OF TRACE ORGANIC MATERIALS IN WATER,
Department of the Interior, Washington, D.C. Office of Saline Water
For primary bibliographic entry see Field 05A.
W71-11920

DATA ON THE BIOLOGICAL EFFECT OF SMALL AMOUNTS OF NATURAL URANIUM IN WATER,
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 05C.
W71-12042

ELIMINATION OF CERTAIN ENTERIC VIRUSES AND BACTERIA FROM SEWAGE IN A CIRCULATORY OXIDIZING CHANNEL,
Meditsinskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 05D.
W71-12043

PROCESSING OF WATER WITH POTASSIUM PERMANGANATE FOR THE ELIMINATION OF TASTES AND ODORS,
S. I. Dobrushina, V. I. Tkachenko, and N. S. Litvinov.
Hygiene and Sanitation, (Russian Translation), Vol 35, No 4, April 1970, p 118-122,

Descriptors: *Potassium compounds, *Taste, *Odors, Potable water, Anaerobic conditions, Ammonia, Dissolved oxygen, Mixing, Coagulation, Sedimentation, Aeration, Disinfection, Coliforms, Water quality control, Water treatment.
Identifiers: *Potassium permanganate, Kiev (USSR), Desna River.

A substantial portion of the population of Kiev is supplied with drinking water from the Desna River. Treatment of the water includes coagulation (with Al2 (SO4)3), sedimentation, filtration, and chlorination. During most of the year, such processing is sufficient. However, just prior to the yearly springtime flood the water develops significant taste and odor problems which are not alleviated by standard treatment methods, and processing with powdered activated carbon and flocculation with PPA polyacrylamide is used. During the winter of 1968-69, conditions became unusually severe, and even the additional treatment was unable to cope with the problem. Standard procedures brought about an odor reduction from 4-5 'points' down to 2 'points' (within the legal limit) but heating of the water to 60 deg. brought renewed odors rising to 3 'points'. At this point, a 1 cu m mixing tank and a 3 cu m solution tank with separate direct lines to the raw water were installed. Laboratory experiments which were performed established that 10 mg/l of KMnO4 would completely eliminate both tastes and odors, whereas 3 mg/l would reduce the taste and odor to 1 'point' with no recurring odors on heating. The KMnO4 was also shown to have a disinfecting effect, curtailing the other wise prolific growth of sporiferous bacteria, and causing considerable improvement of the coli index. KMnO4 treatment was shown to be both effective and economical, and specifically suited for only periodic use. (Lowry-Texas)
W71-12045

BIOLOGICAL EFFECT AND SAFE CONCENTRATION OF SELENIUM IN DRINKING WATER,
Institute of General and Municipal Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 05C.
W71-12047

NEW DATA ON THE MECHANISM OF DISINFECTION OF DRINKING WATER BY CHLORINE AND GAMMA RADIATION,
Moscow Medical Inst. Dept. of Environmental Hygiene (USSR).
A. M. Skidal'skaya.
Hygiene and Sanitation, (Russian Translation), Vol 34, No 11, p 193-200, November 1969, 3 fig, 1 tab, 8 ref.

Descriptors: *Disinfection, *Chlorination, *Irradiation, Fermentation, Bacteria, Coliforms, Enzymes, Coagulation, Analytical techniques, Water treatment, Water quality control.
Identifiers: *Dehydrogenase activity, *Decarboxylase, Deoxyribonucleic acid.

Water containing varying amounts of bacteria was subjected to chlorination in some instances and gamma radiation in others. Chlorine concentrations used ranged from 1 to 250 mg/l while the amount of gamma irradiation applied varied from 50 to 1000 kr. Changes in dehydrogenase activity and the effects on decarboxylation were observed. Inhibition of the enzymes by chlorine proceeded parallel with its bactericidal effect, while the inhibiting effect of gamma irradiation was observed to lag behind the bactericidal effect. Chlorine also inhibited the glutamic decarboxylase of those bacteria studied whereas gamma irradiation produced no such detectable effect. On the other hand, chlorination did not effect nucleotide composition of E. coli DNA whereas gamma irradiation destroyed the DNA molecules. Morphological changes in E. coli, as revealed by electron microscopy, included reduced volume of cells, impaired protoplasm transparency, and damage to the cell membranes. Chlorination of water supplies produced a typical E. coli with altered cultural and biochemical properties which, although they remained avirulent, should be accounted for in water analyses. (Lowry-Texas)
W71-12048

OZONATION, NEXT STOP TO WATER PURIFICATION,
Rene J. Bender.
Power, Vol 114, No 8, p 58-60, August 1970. 5 fig.

Descriptors: *Ozone, *Water purification, *Oxidation, *Chlorination, *Filtration, Waste water treatment, Cost analysis, Analytical techniques, Tertiary treatment, Sewage treatment, Potable water, Taste, Public health, Water quality, Detergents, Phenols, Bacteria, Viruses, Environmental sanitation, Reclaimed water, Water treatment.
Identifiers: *Ozonation.

Because ozone is proving to be a very good oxidizing agent, it is very useful in purification of water by oxidation. It is used mostly in preparation of municipal potable water in increasing numbers of cities and purifying drinking water, mainly in Europe. Although chlorination has done a good, economical job in initially reducing bacterial count, laboratory tests have shown that a supplementary treatment was needed. The purification process calls for chlorination and thorough filtration before ozonation. Ozonation of drinking water offers several advantages over simple chlorination: (1) bacteria and viruses are killed completely in shorter contact time with lesser concentrations; (2) ozone does not affect water taste; (3) ozonation completely destroys phenols and counter-acts the action of detergents. The cost of the ozonation process is from 0.1 cent to 0.2 cents/1000 gallons. An ozonation plant costs about $5,000 per mgd for each ppm of ozone, and a concentration of 1-2 ppm is usually satisfactory. Ozonation is now being used to purify waste water and as a tertiary step following secondary treatment for sewage waste water. (Atkins-Texas)
W71-12052

FUNDAMENTALS OF ION EXCHANGE IN WATER TREATMENT,
Diamond Shamroch Chemical Co., Redwood City, Calif.
For primary bibliographic entry see Field 05D.
W71-12053

AN EVALUATION OF PRESEDIMENTATION AS A PROCESS IN WATER TREATMENT USING SIMULATION TECHNIQUES,
Maryland Univ., College Park. Dept. of Civil Engineering.
W. E. Chicca.
Master's Thesis, Maryland University, January 1970, 86 pgs., 15 tab, 40 ref. OWRR Project A-007-MD (4).

Descriptors: *Water treatment, *Turbidity, *Sedimentation, Simulation analysis, Mathematical models, Computer models, *Regression analysis, Flow rates, Chemical precipitation, Coagulation, Flocculation, Correlation analysis, *Markov processes, Analytical techniques, Model studies.
Identifiers: *Potomac River, *Presedimentation, *Alum requirements, Matrices.

A first order Markov model was used to develop monthly and daily flow sequences which agree statistically with the historic parameters of the Potomac River. Multiple regression analysis of the operating data of the Dalecarlia Water Treatment Plant demonstrated that the plant alum dosing was primarily a function of the river influent turbidity. A linear regression model was the formulated to relate input turbidity to river flow, and 100 years of simulated daily turbidities were computed and used as inputs to the plant operating with and without presedimentation facilities. Treatment plant and presedimentation reservoir operations were simulated by a series of multiple regression equations, in order to compute 100 years of daily alum requirements with and without presedimentation. Results from these analyses indicated that 69 tons of alum per year (2% of the total used) would be saved by construction of presedimentation facilities. Therefore, it was concluded that presedimentation is neither an important nor necessary process in the treatment of Potomac River water. (Lowry-Texas)
W71-12061

SURVEY OF NEBRASKA WATER LAW.
Nebraska Soil and Water Conservation Commission, Lincoln.
For primary bibliographic entry see Field 06E.
W71-12145

IMPLEMENTING PUBLIC WATER SUPPLY REGULATIONS,
R. G. McCall.
American Water Works Ass'n Journal, Vol 63, No 7, p 399-405, July 1971. 7 p, 10 fig.

Descriptors: *West Virginia, *Water treatment, *Treatment facilities, *Data collections, Water supply, Plumbing, Water delivery, Water distribution (Applied); Water works, Water purification, Chlorination, Demineralization, Fluoridation, Water softening, Water quality, Water quality control, Regulation, Testing, Chemical analysis, Legal aspects, Administrative agencies.

Current information concerning the water-supply systems in West Virginia is based on the Department of Health's initial steps to implement revised water supply regulations. These data were obtained from inventory information that was furnished directly from public water supply systems. The author uses this statistical data and graphs to show: (1) the distribution by size of public water supply systems, (2) the extent of public and private ownership of water works, (3) the number of systems providing water treatment, (4) the types of treatment utilized by each system, (5) the number of trained and licensed operators operating systems, and (6) the current and projected need for licensed operators. The author also analyzes the extent and effectiveness of: (1) the Department's review of construction and modification plans, (2) plant inspections, (3) surveillance of cross connections, (4) bacteriological sampling and analysis of public water supplies, and (5) chemical analyses of public water supplies. Concluding with various suggestions to meet future needs, the author urges that legal action be taken on those problems indicated. (Gallagher-Florida)
W71-12171

5G. Water Quality Control

DECISION PROCESSES IN WATER QUALITY MANAGEMENT,
Engineering-Science, Inc., Oakland, Calif. Research and Development Lab.
Richard M. Males, and William E. Gates.
Available from the National Technical Information Service as PB-202 406, $3.00 in paper copy, $0.95 in microfiche. Completion Report, April 1971. 137 p, 22 fig, 2 tab, 2 append. OWRR Project C-1736 (No 3163) (1).

Descriptors: *Decision making, *Water quality, Computer models, *Behavior, Attitudes, California, Social aspects, Political aspects, Psychological aspects, Social function, Social participation, Simulation analysis, Ethics, Legal aspects, Political constraints, Water policy, Planning, Institutions.
Identifiers: Industrial dynamics, Role playing, Social system research, Environmental management, Descriptive model, Role awareness, Conflict, Vested interests.

Various techniques of social system research were combined with simulation modeling of water quality decision-making in the State of California. Focus of the study was on the description of the informal interactions which actually govern decision-making, particularly in regards to regional-State interaction. Time-based behavior, and feedbacks between the social and technical sectors, are taken as important parameters governing overall system behavior. The conflict between long-term and short-term objectives is examined. A behavioral exercise, involving role-playing techniques conducted with members of the California regional water quality control boards, is described in detail. This exercise was used to allow participants in decision-making to explore their own conceptual models of the processes they are working with (both social and technical), and to understand the models of others. Conclusions are drawn relating to the specific decision-making situation in California and its implications for long-term environmental management, and with respect to the nature and ethics of conducting social system research in environmental management. A model environmental management system, incorporating an institutionalization of the adversary process, is presented.
W71-11643

CALIFORNIA OIL CO V DAVENPORT (OIL LESSEE'S STRICT LIABILITY FOR THE POLLUTION OF WATER USED FOR LIVESTOCK).
For primary bibliographic entry see Field 06E.
W71-11652

CONLEY V AMALGAMATED SUGAR CO (PROOF OF BUSINESS DAMAGES CREATED BY STREAM POLLUTION ODOR).
For primary bibliographic entry see Field 06E.
W71-11653

AN ACT RELATIVE TO THE DISCHARGE OF MERCURY INTO WATERS OF THE STATE.
For primary bibliographic entry see Field 06E.
W71-11663

AID TO MUNICIPALITIES FOR WATER SUPPLY, POLLUTION ABATEMENT AND SEWER SEPARATION.
For primary bibliographic entry see Field 06E.
W71-11675

REGIONAL WASTE DISPOSAL ACT.
For primary bibliographic entry see Field 06E.
W71-11681

PRIVATE WASTE DISPOSAL.

New York Conservation Law sec 9-0101 (McKinney Supp 1971).

Descriptors: *New York, *Ultimate disposal, *Water pollution sources, *Sanitary engineering, Legislation, Administrative agencies, Regulation, State governments, Water law, Water policy, Legal aspects, Permits, Waste disposal, Septic tanks, Cesspools, Marinas, Industrial wastes, Treatment facilities, Domestic wastes, Water pollution, Water pollution control, Natural resources, Environmental effects, Environmental sanitation.

No person shall engage in the business of cleaning septic tanks or cesspools or marina sanitary waste-holding facilities, scavenging or disposing of industrial process waste products, or otherwise removing or disposing of solid or liquid wastes from domestic sewer systems and treatment facilities or from waste-producing operations of factories or commercial establishments without first obtaining a certificate of registration from the Commissioner of Environmental Conservation. If the Commissioner determines that the proposed method of transportation and the place or manner in which the waste product is to be ultimately discharged into the waters or land areas will be detrimental to or substantially damage or pollute the environment or natural resources of the state, he may refuse the issuance of such certificate of registration or impose conditions on the issuance thereof so as to adequately protect against unreasonable defilement or degradation of the natural resources of the state. The Commissioner may make rules and regulations implementing this section. Certificate holders shall make an annual report to the Commissioner containing information required by statute or the Commission. Registration shall be renewed annually. (Johnson-Florida)
W71-11688

UNITED STATES V MAPLEWOOD POULTRY CO (DISCRIMINATORY PROSECUTION FOR ILLEGAL REFUSE DISCHARGE).
For primary bibliographic entry see Field 06E.
W71-11689

NELSON V C AND C PLYWOOD CORP (STATUTE OF LIMITATIONS AND THEORIES OF LIABILITY FOR POLLUTING UNDERGROUND WATER).
For primary bibliographic entry see Field 06E.
W71-11692

ENFORCEMENT LIMITATIONS IN WATER QUALITY CONTROL,
Federal Water Quality Administration, Washington, D.C.
Murray Stein.
Water Resources Bulletin, Vol. 6, No. 4, p 473-475, July-August 1970.

Descriptors: *Water pollution control, *Water quality control, *Water quality act, Legislation, Public Health.

The roles of States and the Federal government in enforcing water pollution laws are reviewed. Limitations to enforcement actions stem from statutory distinctions between interstate and intrastate pollution which govern the application of the enforcement authority. Additional limitations stem from the statutory time intervals between procedural stages in an action and from State laws which protect the confidentiality of required reports. However, public support for quality control measures may be instrumental in eliminating the existing statutory limitations. (Little-Battelle)
W71-11693

SHELL OIL CO V BLUBAUGH (DEGREE OF PROOF NECESSARY TO SUSTAIN PERMANENT DAMAGES FOR THE POLLUTION

OF A WATER WELL BY ADJOINING OIL WELL OPERATORS),
For primary bibliographic entry see Field 06E.
W71-11695

METHODS OF REMOVING NITRATES FROM WATER,
Interagency Agricultural Waste Water Treatment Center, Firebaugh, Calif.
For primary bibliographic entry see Field 05C.
W71-11698

ATKINSON V HERINGTON CATTLE CO (FEED LOT OPERATOR'S AND CATTLE OWNER'S JOINT LIABILITY FOR CATTLE WASTE RUNOFF).
For primary bibliographic entry see Field 06E.
W71-11700

SEWAGE, WATER, AND GARBAGE DISPOSAL DISTRICTS.
For primary bibliographic entry see Field 06E.
W71-11707

PROHIBITION AND PENALTY FOR THE POLLUTION OF WATERING HOLES USED BY WILD HORSES.
For primary bibliographic entry see Field 06E.
W71-11710

STATE WATER POLLUTION CONTROL BD V SALT LAKE CITY (LIMITATIONS ON BOARD CONTROL OVER CITY SEWAGE SYSTEM).
For primary bibliographic entry see Field 06E.
W71-11711

MID-CONTINENT PIPE LINE CO V EBERWEIN (Pollution of Farm Water Supply from Oil Pipe Line Leakage).
For primary bibliographic entry see Field 06E.
W71-11713

NORMAN V GREENLAND DRILLING CO (INFERRED LIABILITY FOR WATER POLLUTION FROM OIL PRODUCTION OPERATIONS).
For primary bibliographic entry see Field 06E.
W71-11724

REISERER V MURFIN (SALINE WATER INTRUSTION OF FRESH WATER WELLS FROM OIL DRILLING OPERATIONS).
For primary bibliographic entry see Field 06E.
W71-11728

VERTICAL ADVECTION DIFFUSION AND REDOX POTENTIALS AS CONTROLS ON THE DISTRIBUTION OF MANGANESE AND OTHER TRACE METALS DISSOLVED IN WATERS OF THE BLACK SEA,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W71-11744

CORDER V STATE WATER POLLUTION CONTROL BD (USE OF SUBSTANTIAL EVIDENCE RULE IN DETERMINING THE VALIDITY OF ADMINISTRATIVE DECISION GRANTING PERMIT FOR SEWAGE DISCHARGE).
For primary bibliographic entry see Field 06E.
W71-11782

TRACE MATERIALS IN WASTES DISPOSED TO COASTAL WATERS-FATES, MECHANISMS AND ECOLOGICAL GUIDANCE AND CONTROL,
Federal Water Quality Administration, Corvallis, Oreg. National Coastal Research Program.
For primary bibliographic entry see Field 05B.
W71-11793

THE 50-MILE BALLAST-OIL DUMPING PROHIBITED ZONE OF ALASKA RECONSIDERED IN THE LIGHT OF AVAILABLE DATA GLEANED FROM SIGNIFICANT INCIDENTS,
Federal Water Quality Administration, Corvallis, Oreg. Pacific Northwest Water Lab.
M. H. Feldman.
Working Paper No. 77, October 1970. 22 p, 1 fig, 12 ref.

Descriptors: *Oil wastes, *Alaska, Tides, Sea breezes, Temperature, Density currents, Coasts, Pacific coast region, Climatic zones, Aquatic animals, Aquatic plants, Water birds, Fish, Benthic flora, Micrrorganisms, Water quality control, Waste disposal, Oily water, *Pacific Ocean, Path of pollutants, Water pollution effects, International waters.
Identifiers: *Oily ballast, *Gulf of Alaska.

A thorough literature search was conducted concerning the major oil spills and the damage caused by them. Movement of oils by reason of winds, tides, density currents and other means have been shown to differ to a great extent depending on prevailing temperatures, offshore versus channel versus high seas movements, as well as the character and composition of the oil spilled. Ecological damage done by accidental spills and by seepage has been documented in several instances, but the numbers and diversity of wildlife species inhabiting the Alaskan coastline make the estimation of the magnitude of disaster from major spills difficult. Despite this fact, studies revealed that the Alaskan coastal waters are capable of coping with 10,000 gallons of seepage and from one to two times that amount of accidental spillage per year. However, analysis of coastal wind and wave patterns has demonstrated conclusively that any oil dumped within the 50 mile limit will either sink to the bottom and effect the bottom dwelling organisms, evaporate, or wash up on the beaches. Much evidence was also discovered to indicate that oil washing up on the beaches could have come from much greater distances, but the 50 mile limit is regarded as providing at least marginal protection of the area from ballast-oil. (Lowry-Texas)
W71-11796

THE IMPACT OF IMPOSING A WATER QUALITY STANDARD ON A LIVE STREAM,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
James N. Dornbush, John R. Andersen, John Herreid, Daniel J. Naughton, and Kerwin L. Rakness.
Available from the National Technical Information Service as PB-202 349, $3.00 in paper copy, $0.95 in microfiche. Completion Report, South Dakota Water Resources Institute, June 1971. 84 p, 16 fig, 4 tab, 14 ref, append. OWRR Project B-005-SDAK (6).

Descriptors: Water quality, *Planning, Water resources development, *Streamflow, Beneficial use, Water utilization, Waste water treatment, Reservoirs, Water pollution, Water Quality Act, *Frequency analysis, *Regression analysis, South Dakota, *Standards, *Water quality control, Flow, Water temperature, Biochemical oxygen demand.
Identifiers: *Big Sioux River (S Dak).

An evaluation is presented of the influence of water quality standards on the planning and development of a river basin and on the treatment requirements for wastewater discharges. The Big Sioux River in eastern South Dakota was selected for a case study because the river was largely uncontrolled although intensive investigation was underway for water resources development including multiple purpose reservoirs. Existing flow and water quality data for the river were evaluated and the influence of increased water requirements for irrigation and domestic use was projected to the year 2010. For extended periods of time, the river flow has been exceeded by wastewater discharges. Multiple linea regression was used to develop a mathematical ex pression for the minimum dissolved oxygen in th river in terms of flow, temperature and BOD fo both summer and winter conditions to predict fu ture river flow requirements from proposed reser voirs to maintain the assigned water quality for th proposed beneficial uses. Although a city with population equivalent of 450,000 persons presentl provides 96 to 98% BOD removal, additional treat ment of wastewater is required to meet the impose water quality standards.
W71-11806

POLLUTING WATERS--MISDEMEANOR HEALTH AND QUARANTINE REGULATIONS.
For primary bibliographic entry see Field 06E.
W71-11834

WATER POLLUTION ACT.
For primary bibliographic entry see Field 06E.
W71-11841

UNITED STATES V THE CATHERINE (DISCHARGE FROM VESSELS OF OIL UPON NAVIGABLE WATERS).
For primary bibliographic entry see Field 06E.
W71-11844

GULF OIL CORP V HUGHES (POLLUTION OF WATER WELL FROM OIL COMPANY OPERATIONS).
For primary bibliographic entry see Field 06E.
W71-11848

PENNSYLVANIA GLASS SAND CORP OKLA V OZMENT (DEGREE OF POLLUTION CONTEMPLATED BY A MINING LEASE).
For primary bibliographic entry see Field 06E.
W71-11849

WATER IMPROVEMENT COMMISSION.
For primary bibliographic entry see Field 06E.
W71-11856

POLLUTION CONTROL, ENFORCEMENT.
For primary bibliographic entry see Field 06E.
W71-11857

SOME LEGAL, SOCIAL AND ECONOMIC PROBLEMS OF GROUNDWATER POLLUTION,
Rhode Island Univ., Kingston. Water Resources Center.
Arthur D. Jeffrey, D. Barlowe Burke, Jr., and Irving A. Spaulding.
Available from the National Technical Information Service as PB-202 420, $3.00 in paper copy, $0.95 in microfiche. Completion Report, 1971, 21p, ref. OWRR A-032-RI.

Descriptors: *Water law, *Groundwater, *Pollution, Administration, Nuisance, Negligence, Reasonable use, *Rhode Island, Water pollution control, Legal aspects, Social aspects, Water quality, Economic impact.

The purpose was to ascertain the legal theories under which pollution of groundwater is policed in Rhode Island. A study of that law indicated that the underlying legal theory is uncertain, so the author went on to suggest his own views of the situation--and to suggest legal theory which would preserve the quality of the state's groundwater resources. The enforcement of present laws relating to such pollution was also studied in the field and through state records. The enforcement process was found ad hoc and not concerned with upgrading and preservation of water quality. Water quality data are assembled, but little use is made of them by state officials. To improve this situation, the law i

the area must be moved beyond the concept of public health laws, toward a notion of water law that balances many possible uses for our water supply and recognizes the existance of hydro-ecology in a water shed.
W71-11863

LEGAL, ECONOMIC, AND TECHNICAL ASPECTS OF LIABILITY AND FINANCIAL RESPONSIBILITY AS RELATED TO OIL POLLUTION,
George Washington Univ., Washington, D.C. Program of Policy Studies in Science and Technology.

Available from the National Technical Information Service as PB198 776, $6.00 in paper copy, $0.95 in microfiche. Report No CG-OIL-70-2, Dec 1970. 347 p. DOT Contract-CG-10255-A.

Descriptors:
Identifiers: *Water pollution, Oils, *Law jurisprudence, Water pollution, *Government policies, Water pollution, *Economic analysis, Water pollution, *Liabilities, Water pollution, Abatement, Petroleum industry, Insurance, Petroleum transportation, Marine transportation, Cleaning, Losses, International trade, Ecology, Prevention, Oil storage, Offshore drilling, *Oil pollution, *Water pollution control, Water quality Improvement Act.

The report presents an intensive study of the oil pollution problem in its legal, economic and technical aspects. The contents include the following: Analysis of the water quality improvement act (WQIA) pertaining to control of oil pollution; Theories of liability and their relation to oil pollution; Potential problems of the act; Jurisdiction, Liability; Proof of financial responsibility to meet liabilities; Economic principles of liability and financial responsibility for oil pollution; Oil pollution prevention, and carrier liability; Economic models for analysis of problems; Relationships between cleanup costs and quantity of oil spilled; Measures of the potential economic loss from pollution; International trade implications of U.S. policies relating to oil pollution; The nature, behavior, and ecological effects of oil spills; Methods for containment and cleanup of oil spills; and Oil pollution prevention and the characteristics of the oil industry production, transporting, and storage facilities.
W71-11872

OIL DISCHARGE PREVENTION AND POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W71-11877

VERMONT WATER POLLUTION CONTROL, MONT PELIER.
For primary bibliographic entry see Field 06E.
W71-11883

WHEY POLLUTION ABATEMENT.
For primary bibliographic entry see Field 06E.
W71-11888

CITY OF UTICA V WATER POLLUTION CONTROL BD (LEGISLATIVE DELEGATION OF POLLUTION CONTROL AUTHORITY).
For primary bibliographic entry see Field 06E.
W71-11902

STATE V OLE OLSEN, LTD (DEVELOPER'S INSTALLATION OF INADEQUATE SEWAGE DISPOSAL SYSTEM).
For primary bibliographic entry see Field 06E.
W71-11904

UNITED STATES V LEBEOUF BROS BARGE CO (UNAVOIDABLE ACCIDENT AS A DEFENSE TO OIL SPILLS).
For primary bibliographic entry see Field 06E.
W71-11912

DOUGLAS AIRCRAFT CO V KERNS (PERMANENT DAMAGES FROM STREAM POLLUTION),
For primary bibliographic entry see Field 06E.
W71-11922

UNITED STATES V BALLARD OIL CO OF HARTFORD (DISCHARGE OF OIL INTO NAVIGABLE WATER).
For primary bibliographic entry see Field 06E.
W71-11923

UNITED STATES V THE VESSEL JUPITER (ADMIRALTY ACTION FOR VIOLATION OF OIL POLLUTION ACT).
For primary bibliographic entry see Field 06E.
W71-11925

POWELL BRISCOE, INC V PETERS (INJUNCTIVE RELIEF AGAINST OIL AND GAS LESSEE).
For primary bibliographic entry see Field 06E.
W71-11930

FARMERS IRRIGATION CO V GAME AND FISH COMM (FISH HATCHERY'S LIABILITY FOR WATER POLLUTION).
For primary bibliographic entry see Field 06E.
W71-11934

SUN OIL CO V HOKE (OIL LESSEE'S DUTY TO PREVENT POLLUTION).
For primary bibliographic entry see Field 06E.
W71-11936

CLEARY PETROLEUM, INC V COPENHAUER (LIABILITY FOR POLLUTING LIVESTOCK WATER).
For primary bibliographic entry see Field 06E.
W71-11937

FELL AND WOLFE OIL CO V STATE (CONDITIONS PRECEDENT TO CONVICTION FOR POLLUTION).
For primary bibliographic entry see Field 06E.
W71-11939

CITY OF HENRYETTA V RUNYAN (MEASURE OF DAMAGES FOR TEMPORARY POLLUTION).
For primary bibliographic entry see Field 06E.
W71-11959

WATER-DEGRADABLE POLYMERS FOR CONTROLLED RELEASE OF HERBICIDES AND OTHER AGENTS,
Austin Science Associates, Inc., Tex.
M. L. Beasley, and R. L. Collins.
Science, Vol. 169, p 769-770, August 21, 1970. 4 ref.

Descriptors: *Organic acids, *2-4-D, *2-4-5-T, Insecticides, Nematocides, Fungicides, Rodenticides, Defoliants, Path of pollutants, Chemical degradation, Water pollution control.
Identifiers: *Polymers, Slimicides.

A new class of polymeric substances that degrade in the presence of water are formed by the reaction of carboxylic acids with metal ions in the presence of an aldehyde catalyst. Acids that have been polymerized include the herbicides 2,4-D, 2,4,5-T, Silvex, Dicamba, and Picloram. Since polymerized herbicides do not wash off like ordinary herbicides, adequate weed control can be achieved with lighter and fewer applications. Consequently, ecological disturbances caused by the toxic chemicals are lessened. (McCann-Battelle)
W71-11961

CORWINE V MARACAIBO OIL EXPLORATION CO (POLLUTION OF STOCK POND BY ADJOINING OIL LESSEE).
For primary bibliographic entry see Field 06E.
W71-11966

DELAWARE ESTUARY AND BAY WATER QUALITY SAMPLING AND MATHEMATICAL MODELING PROJECT.
Delaware River Basin Commission, Trenton, N.J.
For primary bibliographic entry see Field 05A.
W71-11968

CITIES SERVICE OIL CO V BILLEN (PERMISSIVE POLLUTION OF UNDERGROUND WATERS).
For primary bibliographic entry see Field 06E.
W71-11969

GEOCHEMICAL SURVEYS V DIETZ (DAMAGES FOR WELL POLLUTION THROUGH NEGLIGENT DISPOSAL OF SALT WATER).
For primary bibliographic entry see Field 06E.
W71-11970

SUNRAY MID-CONTINENT OIL CO V TISDALE (WATER POLLUTION FROM THE NEGLIGENT PLUGGING OF AN OIL WELL).
For primary bibliographic entry see Field 06E.
W71-11971

DRAKE V SMITH (POLLUTION OF COMMUNITY WATER SUPPLY).
For primary bibliographic entry see Field 06E.
W71-11973

WARDROP V CITY OF MANHATTAN BEACH (LIABILITY FOR STORING CONTAMINATED WATER).
For primary bibliographic entry see Field 06E.
W71-11976

SWANGO V COUNTRY SQUIRE MOTEL, INC (INJURY TO CATTLE FROM POLLUTED WATER).
For primary bibliographic entry see Field 06E.
W71-11988

COLLECTION OF OIL SLICKS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
R. H. Cross, III, and D. P. Hoult.
ASCE Proceedings, Journal of the Waterways, Harbors and Coastal Engineering Division, Vol 97, No WW-2, Paper 8122, p 313-322, May 1971. 6 fig, 3 ref, append. FWQA Contract 15080 ESL.

Descriptors: *Oil wastes, *Oily water, *Water pollution treatment, *Water pollution control, Critical flow, Hydraulics, Industrial wastes, Hydrodynamics, Equipment.
Identifiers: *Oil spills, *Oil spill treatment, *Oil skimmers.

Large oil spills, both at sea and in protected waters, require collection techniques with capacities beyond those of existing equipment. The basic collector or skimmer configuration consists of a large V-shaped skimmer, with the oil pumped from the apex. In the V, a captive pool of oil forms, whose length and depth near the apex depends on the skimmer speed and oil density. This captive pool is much thicker than the undisturbed slick. The removal rate is limited by the occurrence of critical flow of the oil towards the removal device. Increased pumping rates merely pump more water with the oil. For a given removal device in the throat, the maximum removal rate is limited by the maximum pool depth just upstream of the throat. This depth, in turn, is limited by the skimmer barri-

er depth, and by the skimmer length and speed. Another upper limit is given by the overall width of the skimmer. The dynamics of the captive pool and throat region are described, and design criteria given. (Knapp-USGS)
W71-11989

A BILL TO AMEND THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 TO REQUIRE THE SECRETARY OF THE ARMY TO TERMINATE CERTAIN LICENSES AND PERMITS RELATING TO THE DISPOSITION OF WASTE MATERIALS IN THE WATERS OF THE NEW YORK BIGHT, AND FOR OTHER PURPOSES.
For primary bibliographic entry see Field 06E.
W71-12037

POLLUTION CONTROL AND MANAGEMENT.
Charles River Associates, Inc., Cambridge, Mass.

Available from the National Technical Information Service as COM-71-0061, $3.00 in paper copy, $0.95 in microfiche. New England Regional Commission, Boston, Mass, October 1969. 271 p, 21 fig, 159 tab.

Descriptors: *Environmental sanitation, Air pollution, *Solid wastes, Water quality control, Municipal wastes, Industrial wastes, Thermal power plants, Pulp and paper industry, Textiles, Water treatment, Water re-use, Waste water treatment, Aesthetics, Cost analysis, Landfills, Incineration, Transportation, *New England, *Waste disposal, Water pollution control.

A review, organization, and analysis of existing sources of information on waste generation and disposal was conducted with particular reference to the highly industrialized area of New England. For convenience sake, the discussion was divided into airborne wastes, water borne wastes, and solid wastes. In addition, water borne wastes were further subdivided into municipal and industrial waterborne wastes. In each particular subdivision, the main emphasis was placed on accurately describing the problem and suggesting alternative actions, not constructing a final solution for each segment. Existing systems for disposal of each individual waste product are discussed with reference to its origin, the more popular disposal methods, and the magnitude of the problem in the near future. The most difficult obstacle to sound engineering and economic analysis is the lack of any evaluation of the benefit of cleaner air to breathe and cleaner water in streams. For optimal use of resources allocated for pollution control measures, a marginal cost must balance its marginal benefit. However, the benefit is so variable, depending upon geographic locations and sometimes even weather conditions, that much further research is needed to provide a concise accurate picture of the financial dimensions of the pollution abatement effort. (Lowry-Texas)
W71-12063

UNITED STATES V STEEL TANK BARGE RAINIER.
For primary bibliographic entry see Field 06E.
W71-12066

TELLIS V MUNICIPAL COURT, CENT JUD DIST, CITY OF MARIN (REGULATING SEWAGE DISPOSAL FROM BOATS THROUGH COUNTY ORDINANCE).
For primary bibliographic entry see Field 06E.
W71-12075

PEOPLE V NEW PENN MINES, INC (ABATEMENT OF NUISANCE CAUSED BY THE DRAINAGE OF MINE WASTES).
For primary bibliographic entry see Field 06E.
W71-12079

UTILIZATION OF WATER DEVELOPMENT FUNDS.
For primary bibliographic entry see Field 06E.
W71-12095

RHONE-MEDITERRANEAN-CORSICA BASIN AGENCY (AGENCE DE BASSIN RHONE-MEDITERRANEE-CORSE),
Agence de Bassin Rhone-Mediterranee-Corse, Paris (France).
J. L. Lacroix.
L'Eau, March 1969, No. 3, p. 147-160. 1 fig.

Descriptors: *Water pollution, *Water pollution control, *Water pollution treatment, *Pollution abatement, *Water quality, Conduits, Diversion, Urbanization, Industrial wastes, Agriculture, Aquifers, Municipal wastes, Saline water, Sprinkler irrigation, Droughts, Oxygenation, Settling basins, Treatment facilities, Planning, Alluvium, Budgeting, Coasts.
Identifiers: *Rhone-Mediterranean-Corsica Basin Agency, France, Spain, Italy, Semi-arid lands, Alps, Lyon, Marseille, Nice.

The Rhone-Mediterranean-Corsica basin in France covers 130,000 square kilometers and has over 10 million inhabitants. It is a geographically fluvial unit with a semi-arid coast from Spain to Italy and upstream water diversion conduits to neighboring provinces. Water pollution, a chief problem, is massive due to urban and industrial growth. It is diffuse along the coast and in the alps, and steady along the industrial alpine valleys. Aquifers, which provide municipal water, are being contaminated, industry is demanding higher water quality and agriculture threatens salt pollution by sprinkler irrigation. The Rhone-Mediterranean-Corsica Basin Agency is investing in treating urban and industrial water pollution by oxygenation and settling processes. About 34 million francs will be used between 1969 and 1973. Urban and rural plants at Lyon, Marseille, Nice and other cities will cost 400 million francs for a period of 20 years. Planning and resort synthesis include salt-pollution and protection of alluvial aquifers. A general financial budget is presented. (Popkin-Arizona)
W71-12101

SCIENTIFIC PRINCIPLES OF THE COMPLEX UTILIZATION AND CONSERVATION OF WATER RESOURCES,
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 06B.
W71-12107

MANAGING THE ENVIRONMENT: NINE STATES LOOK FOR NEW ANSWERS,
Smithsonian Institution, Washington, D.C.
E. H. Haskell, V. Price, W. Matthews, R. Cook, and J. Davidson.
April 1971. 445 p, 17 fig, 19 chart.

Descriptors: *State governments, *Water pollution control, *Management, *Water resources development, Illinois, Minnesota, Washington, Wisconsin, New York, Vermont, Maine, Maryland, Michigan, Environment, Pollution abatement, Administrative agencies, Institutions, Political aspects, Water policy, Planning, Land management, Legal aspects, Waste treatment, Waste disposal.

This report describes recent changes initiated by nine state governments to improve their environmental management in areas such as water pollution. The focus is on governmental structures designed to give impetus to existing environmental programs and on organizations created to carry out new state responsibilities in areas such as waste treatment and disposal. Four types of state governmental institutions are discussed: (1) consolidated environmental departments; (2) land-use management agencies; (3) waste management agencies; and (4) state courts, which have been given a new role in environmental protection through public interest lawsuits by private citizens. Highlights of the trends observed in the several states are reported. A state-by-state analysis describes: (1) the organizational features of the new institutions and their legal responsibilities, (2) problems and objectives of the structural designers and the political process that resulted in change, (3) current structures and agency functions, and (4) issues which merit watching as the new or modernized institutions develop key statutes. A bibliography and other relevant documents are appended after each chapter. (Smiljanich-Florida)
W71-12144

SURVEY OF NEBRASKA WATER LAW.
Nebraska Soil and Water Conservation Commission, Lincoln.
For primary bibliographic entry see Field 06E.
W71-12145

WATERS AND WATER RIGHTS, WATER POLLUTION AND QUALITY CONTROLS,
B. J. Gindler.
Waters and Water Rights, Vol 3, 1967. 540 p, 1 chart.

Descriptors: *Water pollution control, *Water quality control, *Remedies, *Administration, State governments, Federal government, Water pollution, Riparian rights, Water pollution effects, Water pollution treatment, Administrative agencies, Standards, Relative rights, Prior appropriation, Jurisdiction, Interstate, Interstate compacts, International law, Water Quality Act, Legislation, Judicial decisions, Legal aspects.
Identifiers: Water Pollution Control Act.

A comprehensive review and analysis is made of state and federal water pollution control laws. Emphasis is placed on the symbiotic relationship between the legal and scientific specialists in water matters. A brief description is made of the effects man can have on water quality and of legal means by which man's activities can be controlled and natural conditions improved. The history of water quality laws is summarized. The water quality controls enforceable in state courts are principally of a private nuisance nature. The laws pertaining to nuisance are discussed. The basic doctrine in this area of the law is that the gravity of the harm caused to plaintiff's water use is compared with the utility of the use by which defendant has polluted those waters. This doctrine is extrapolated into the laws of appropriative water rights. Various other remedies are discussed. The power of state agencies to regulate water quality is analyzed. Another section considers water pollution controls arising from interstate litigation, interstate compacts, international law, and specific federal statutes, especially the Federal Water Pollution Control Act. The Act's administration, approach, and procedures are extensively discussed. (Smiljanich-Florida)
W71-12146

WATER POLLUTION -- 1970, PART 2.

Hearings on S3687--Subcomm on Air and Water Pollution--Comm on Public Works, US Senate 91st Cong, 2d Sess, p 403-902 (April 28, 29, 30 May 1 and 6, 1970). 502 p, 53 tab, 4 chart, 21 ref 14 append.

Descriptors: *Treatment facilities, *Monitoring *Eutrophication, *Toxins, United States, Federal government, Legal aspects, Political aspects, State governments, Thermal pollution, Water pollution Water resources development, Cost repayment Regulation, Reimbursable costs, Nitrates, Water pollution sources, Heated water, Environmental sanitation, Water pollution control.
Identifiers: *Effluent charges.

The testimony at these hearings was concerned with pending bills relating to water pollution control. Many witnesses expressed their views on the changes in federal financing of water pollution con

trol plants. There was concern expressed for the lag in federal reimbursement to states for funds expended on construction of waste treatment facilities and for the great need for increased federal expenditures in this area of construction. Dr. Henry Jacoby, a Harvard professor of government, discussed the feasibility of a charge on effluents, stressing that the charge must be effective as a deterrent. Two more professors pointed out the need for both a control over pollutants before they reach the water system and a modern system of monitoring water systems to determine when specific pollutants are present. Dr. Samual Epstein gave thorough testimony on the potential biological hazards arising from the presence of nitrates in water and to the proposed use of nitrilotriacetic acid detergents. He included documents on other chemical pollutants, including mercury, 2,4,5-T, dioxins, and others. Appended to the record were a report on the eutrophication problem and a detailed study of the effects of waste heat on Lake Michigan. (Johnson-Florida)
W71-12147

THE FEDERAL GOVERNMENT AND ENVIRONMENTAL CONTROL: ADMINISTRATIVE REFORM ON THE EXECUTIVE LEVEL,
Boston Coll., Mass. School of Law.
For primary bibliographic entry see Field 06E.
W71-12150

LAWS OF THE UNITED STATES RELATING TO WATER POLLUTION CONTROL AND ENVIRONMENTAL QUALITY.
U.S. House of Representatives, Washington, D.C. Committee on Public Works.
For primary bibliographic entry see Field 06E.
W71-12151

THE ENVIRONMENTAL LAW HANDBOOK,
Interstate Sanitation Commission, New York.
For primary bibliographic entry see Field 06E.
W71-12152

WATER QUALITY CONTROL (DESIGNATED USES AND CRITERIA).
Pennsylvania Sanitary Water Board, Harrisburg.

Rules and Regulations, Article 301, (1968). 24 p.

Descriptors: *Pennsylvania, *Water pollution control, *Water quality control, *Regulation, Pollution abatement, Administrative agencies, Administrative decisions, Standards, Water pollution, Water quality, Environmental sanitation, Water resources, Water utilization, State governments.

Water uses herein protected include aquatic life, water supply, and recreation. General water quality criteria provide that water shall not contain substances attributable to municipal, industrial, or other waste discharges in concentration or amounts sufficient to harm protected water uses or human, animal, plant, or aquatic life. Substances to be controlled include, but are not limited to, floating debris, oil scum, and other floating materials; toxic substances; and substances that produce color, tastes, odors, or settle to form sludge deposits. Specific criteria are set forth. Detailed tables list the waters of Pennsylvania and then give the limits of the particular area along with the specific water uses and criteria applicable to each body of water. (Robinson-Florida)
W71-12153

WATER POLLUTION CONTROL (DEPARTMENT OF DEFENSE WATER POLLUTION ABATEMENT PROCEDURES).
Department of Defense, Washington, D.C.

32 Code of Federal Regulations, part 243 (1970). 5 p, 1 tab.

Descriptors: *Federal government, *Military reservations, *Water pollution control, *Treatment facilities, Water treatment, Water pollution treatment, Federal project policy, Water quality control, Pollution abatement, Administration, Adoption of practices, Supervisory control (Power), Administrative decisions, Integrated control measures, Water pollution, Inter-agency cooperation, Contract administration, Budgeting, Institutional constraints, Project planning, Environmental sanitation, Legal aspects.

Pursuant to Executive Order 11288, Department of Defense (DOD) policies and procedures are herein established for the development and submission of water pollution control plans. Budgetary requests for military construction programs shall include a statement of compliance with Executive Order 11288. Water pollution abatement projects will, in general, be included in military construction programs. Pollution control systems shall be designed to meet standards set forth in Executive Order 11288. Construction contracts awarded subsequent to March 30, 1967, must meet the requirements for new facilities contained in Executive Order 11288. Department components may directly communicate with specified federal agencies for advice and assistance, and will provide the Federal Water Pollution Control Administration with information concerning potential pollution sources. Each DOD component will: (1) update and revise the fiscal water pollution control plan for existing facilities, (2) submit such plan for DOD Environmental Pollutinon Control Committee review, and (3) submit twenty copies of an annual fiscal year progress report. Reporting procedures will be governed by the regulations and format herein set forth. (Earl-Florida)
W71-12154

EVALUATION OF PRELIMINARY APPLICATIONS FOR BASIC WATER AND SEWER FACILITIES GRANTS.
Federal Register, Vol 36, No 125, p 12219-12220 (June 1971). 2 p.

Descriptors: *Federal government, *Grants, *Sewers, *Water supply, Administrative decisions, Sewage treatment, Waste water treatment, Administration, Administrative agencies, Legal aspects, Sewage disposal, Water treatment, Water purification, Government finance, Financing, Economics, Planning, Water policy, Adoption of practices, Supervisory control (Power), Local governments.

Pursuant to section 702 of the Housing and Urban Development Act of 1965, criteria and procedures to be used in evaluating preliminary applications by local public bodies and agencies for federal grants for basic water and sewer facilities are herein set forth by the Secretary of Housing and Urban Development. Applications should include the legal name and address of the applicant, a brief description of the project and its purpose, a list of the localities to be served, the public interest and necessity for the project, and the proposed method of financing including the total cost and grant requested. The criteria for evaluating applications are divided into the following categories: (1) orderly growth and development, (2) financial need, (3) housing, (4) health, (5) local job and business opportunity, and (6) community development. These criteria are subdivided into further elements. Points are awarded for each element present in the application. Preliminary applications will be placed on a potential project list if they have a high rating, and the other applications will be returned with advice as to areas of deficiency. (Robinson-Florida)
W71-12155

PREVENTING AND CONTROLLING POLLUTION OF THE POTOMAC RIVER.
District of Columbia City Council, Washington, D.C.

District of Columbia Regulations, Health Regulations, tit 8, secs 2:801 thru 2:806 (1970).

Descriptors: *District of Columbia, *Water pollution control, *Public health, *Erosion control, Water pollution, Water quality, Water quality control, Water policy, Pollution abatement, Environmental sanitation, Regulation, Local governments, Legislation, Water law, Legal aspects, Rivers, Boats, Marinas, Ships, Construction, Erosion, Sediments, Permits.
Identifiers: *Potomac River.

No permit for any construction activities shall be issued until adequate erosion prevention measures are established. Storm water drainage shall not be allowed to be discharged in such a manner as to erode any land. No waste, whether liquid or solid, treated or untreated, shall be discharged into the Potomac River or its tributaries from any vessel berthed at a marina, dock, or basin. Every marina, dock, or basin where watercraft are berthed shall have urinals, water closets, lavatories, and bathing facilities. Persons engaged in operations which may result in providing a source of pollution affecting the Potomac River at the time of promulgation of these regulations shall be excused from the requirements of these regulations. Such variances shall be allowed only to the extent necessary to avoid undue hardship, and only when adequate protection can be afforded to the public. Records of such variances must be kept, and they shall be open to the public. Violators of these regulations shall be punished by a fine of not more than $300. Each day of such violations shall constitute a separate offense. (Robinson-Florida)
W71-12156

POWER OF STATE OF INDIANA TO PREVENT POLLUTION OF THE OHIO RIVER.

Indiana Law Journal, Vol 18, p 132-135 (1943). 4 p, 21 ref.

Descriptors: *Indiana, *Water pollution control, *Water quality control, *Ohio River, Water pollution, Pollution abatement, Water quality, Jurisdiction, State jurisdiction, Legal aspects, Water law, Interstate commissions, Interstate compacts, Interstate rivers, River basin commissions, River basins, Rivers, Legislation, Remedies.

Because of pollution of the Ohio River, the Interstate Commission on the Ohio Basin drafted and submitted to the nine states of the Basin the Ohio River Valley Water Sanitation Compact. The Compact provides sufficient authority to prevent pollution, but it is inoperative because it has not been adopted by all nine states. Therefore, two questions arise: (1) Does Indiana have the power to prevent pollution of its streams, (2) Is the Ohio River within Indiana's jurisdiction for the exercise of these powers. Indiana courts have recognized stream pollution as a public nuisance and have issued successful indictments against offenders. Legislation gives the state Board of Health the power to prevent the pollution of streams. The southern boundary of Indiana is the low water mark of the Ohio River, and the River itself is within the boundaries of Kentucky. The United States Supreme Court, the courts of Kentucky, and the courts of Indiana have, however, upheld Indiana's concurrent jurisdiction over the River. Indiana, therefore, has the power to enforce its pollution laws against persons who dump sewage directly into the Ohio River and who are subject to its jurisdiction. (Robinson-Florida)
W71-12157

WATER POLLUTION CONTROL IN NEW YORK,
Andrew Halloran.
Albany Law Review, Vol 31, p 50-61 (1967). 12 p, 70 ref.

Descriptors: *New York, *Legislation, *Water pollution control, *Judicial decisions, Riparian rights, Pollution abatement, Relative rights, Water quality control, State governments, State jurisdiction, Water pollution, Water pollution sources, Regulation, Permits, Local governments, Public health, Water resources, Water pollution treatment, Waste

disposal, Legal aspects, Sewage treatment, Sewage disposal, Financing.

The history and development of pollution control in New York is examined in this article. Emphasis is placed upon recent statutory programs and current problems of enforcement. The common law development of the doctrine of riparian rights is traced from its early beginnings to the present. The concept of a riparian right did not develop in the common law until early in the nineteenth century. The common law rule in New York is considered with emphasis placed on the early approach of New York courts in refusing to balance the hardships in pollution cases. This practice was effective in stopping pollution. This approach, however, was subsequently abandoned by New York courts when dealing with pollution cases. Legislative enactments are considered with emphasis placed upon 1949 and 1965 water pollution statutes. The article concludes by considering several recently decided court decisions dealing with pollution. Although there is much current enthusiasm within the state concerning its water resources, the future effectiveness of the present program remains to be seen. (Horwitz-Florida)
W71-12158

WATER QUALITY MANAGEMENT,
Elbert Hooper.
In: Pollution and Industrial Waste, p 1-48, 4 PLI Criminal Law and Urban Problems, 1970. 48 p.

Descriptors: *State jurisdiction, *Administrative decisions, *Water quality control, *Standards, Federal government, Water pollution, Water pollution control, State governments, Jurisdiction, Regulation, Supervisory control (Power), Administrative agencies, Legal aspects, Permits, Project planning, Industrial wastes, Effluents, Waste water disposal, Legislation.
Identifiers: *Federal Water Pollution Control Act.

In the view of the speaker whose address is herein reprinted water quality management presents many complex legal and pragmatic problems. This lecture centers on the problems which accompany the the establishment and implementation of water quality standards. Water quality management must recognize its interrelationship with other environmental problems. The speaker provides explicit definitions of such terms as water quality, pollution, and water quality standards. Water quality management and policy can be divided into two aspects: (1) a consideration of the water user and (2) a consideration of the waste discharger. Effluent standards, specifications for waste treatment methods, water quality standards, and permit systems are all administrative tools of water management. Specific methods of establishing water quality standards, the waters subject to such standards, and the consequent intergovernmental relationships are examined. The enforcement and revision of standards, factors affecting future quality standards, and President Nixon's views on pollution are also discussed. Answers are provided for specific questions relating to such topics as federal non-degradation policy, pre-existing water pollution, lowering standards, determining reasonable mixing zones, and federal preemption. (Horwitz-Florida)
W71-12159

SOLID WASTE DISPOSAL,
James Quigley.
In: Pollution and Industrial Waste, p 49-80, 4 PLI Criminal Law and Urban Problems, 1970. 32 p.

Descriptors: *Pollution abatement, *Solid waste, *Waste disposal, *Ultimate disposal, Legal aspects, Legislation, Water pollution control, Federal government, Water quality, Water quality control, Air pollution, Waste treatment, Water pollution, Sludge disposal, Garbage dumps, Landfills, Municipal wastes, Waste dumps, Waste storage, Wastes, Project planning, Biodegradation.
Identifiers: Solid Waste Disposal Act.

In the view of the speaker presenting this lecture, the problem of solid waste disposal is the most overwhelming, the most challenging, and the one area of pollution abatement that has received the least attention. There have been no new techniques in the disposal of garbage and trash in many years. There are only four ways to dispose of solid wastes: (1) burning it, (2) burying it, (3) drowning it, or (4) kicking it around until it gets lost. Each method is discussed and deemed unsatisfactory. Burning results in air pollution. Dumping and sanitary landfills often result in the pollution of groundwater. Water dumping is also unsatisfactory because of the resulting water pollution. The Solid Waste Disposal Act of 1965 is discussed and deemed inadequate. New technical and legal proposals for solid waste disposal are examined. Explored in this discussion are such problems as the legal aspects of solid waste disposal, the multiplicity of agencies, and budgets. Specific answers are provided on such topics as the Japanese compression technique, abandoned automobiles, recycling, biodegradable products, and resource restoration. (Horwitz-Florida)
W71-12160

FEDERAL INVOLVEMENT IN POLLUTION CONTROL,
Sidney Edelman.
In: Pollution and Waste Control, 4 PLI Criminal Law and Urban Problems, p 273-305 (1970). 33 p.

Descriptors: *Federal government, *Pollution abatement, *Regulation, *Public health, Air pollution, Water pollution, Water pollution control, State governments, Jurisdiction, Legal aspects, Damages, Remedies, Water Quality Act, Legislation, Project planning, Inspection, Clean Air Act, Standards, Water pollution sources, Water pollution effects.

This article considers procedures for enforcement of federal air and water pollution control laws and regulations. The federal government has become involved in the area of pollution control in order to: (1) act as an objective, impartial party in disputes between states; (2) alleviate the problems caused by the inability of many states to handle pollution problems; and (3) obviate the effect of strong local pressures against pollution control by industry. The legal basis for federal involvement is considered to be the commerce clause of the United States Constitution. Since interstate commerce is deemed to include all movement of persons or things across state lines, whether or not for profit, virtually all forms of air and water pollution are potentially under federal control. Special attention is given to intrastate pollution and the regulation of airspace, along with the constitutional basis for air pollution control. A specific example of enforcement under the Clean Air Act points out the problems in defining pollution, public health, and public welfare, as well as the pragmatic difficulties in proving and abating pollution. The case history demonstrates that enforcement procedures under the federal legislation are very time consuming. (Horwitz-Florida)
W71-12161

THE LEGISLATIVE PROCESS,
Leon Billings.
In: Pollution and Waste Control, p 307-339, 4 PLI Criminal Law and Urban Problems, 1970. 33 p.

Descriptors: *Water pollution control, *Federal government, *Legislation, *Political constraints, Legal aspects, State governments, Jurisdiction, Pollution abatement, Permits, Standards, Regulation, Administration, Industrial wastes, Water pollution, Air pollution, Water quality control, Administrative agencies, Waste disposal, Waste treatment, Political aspects, Institutional constraints.

In the view of the lecturer whose address is herein set forth existing laws on pollution control are a mixture of foresight and compromise: foresight because they were enacted before a general national concern developed, and compromise because that lack of national concern made enac ment of tough proposals difficult. Now that t public is demanding legislation in this area Co gress is taking action in four major areas: (1) e vironmental standards, (2) public participatio (3) funding, and (4) enforcement. Environmen quality standards are the prescriptive mechanis for achieving water and air quality. The develo ment of standards through a process of publ hearings also provides an opportunity to determi public goals and to ascertain the extent to whi those goals are feasible. Public participation deemed important to insure that decisions close reflect the concerns of the public and not the reg lated. Funding and enforcement are both given greater chance for success due to public concer The probability of stringent federal legislation discussed. Questions relating to such topics as s titudes of national administrations, the issuance permits, deferral to state regulation, quality sta dards, litigation and enforcement, effluent charge solid waste disposal, legislation, and water refu act violations are answered. (Horwitz-Florida)
W71-12162

OBSERVATIONS ON FLORIDA'S AQUACU TURE LAW,
For primary bibliographic entry see Field 06E.
W71-12163

MINE DRAINAGE CONTROL MEASURE AN MINE WASTE CONTROL PROGRAM.
Illinois Dept. of Public Health, Springfield. Div. Sanitary Engineering.

Technical Release 20-12, 12A, May 1960. 2 p.

Descriptors: *Water pollution control, *Mi drainage, *Coal mine wastes, State government Regulation, Standards, Administrative agencie Administrative decisions, Legal aspects, Water la Water pollution, Water quality, Water quality co trol, Pollution abatement, Environmental sanit tion, Mine wastes, Acid mine water, Mine wate Mine acids, Water pollution sources, Coal mine Mineral industry, Adoption of practices.

Surface and ground waters shall be diverted fro mine workings, and any water which does enter t working shall be handled so as to prevent wat pollution. Mine slurry drainage and refuse from t mining and processing of coal shall be regulated avoid pollution. Carbonaceous and sulfuric mate al shall not be used for road building or given aw for this purpose. If necessary, consideration sh be given to the treatment of mine drainage chemical or other means. Mine property owne have a continuing responsibility to prevent strea pollution by mine drainage. All practicable mi closing measures shall be used to prevent mi drainage. Administrative procedures for the i vestigation of complaints, observation of mi discharges, and the routine cataloging of mines a set forth. Procedures are set forth relating sampling, engineering reports, field visits, a prehearing conferences. Where progress is u satisfactory the following steps may be taken: injunction request, (2) formal hearing and/or information filed with the states attorney. (Robi son-Florida)
W71-12164

WATER QUALITY CRITERIA ON INTER AN INTRA STATE STREAMS.
West Virginia Dept. of Natural Resources, Cha leston. Div. of Water Resources.

Administrative Regulations, 1970. 44 p.

Descriptors: *West Virginia, *Water pollution co trol, *Water quality control, *Standards, Admin trative decisions, Administration, Administrati agencies, Regulation, Water pollution, Wat quality, Pollution abatement, Environmen sanitation, Water policy, Trout, Water resourc State governments.

Certain general conditions prohibited in state waters are set forth, along with requirements for reporting spills and accidental discharges. Acid mine drainage control measures are prescribed. Water uses and water quality criteria for particular bodies of water are specified. Requirements for coin operated and other commercial laundries and coin operated and other commercial car washing establishments are described. Water uses and water quality criteria for trout streams are explained. Allowable means of waste and sludge disposal are provided. (Robinson-Florida)
W71-12165

THE ENVIRONMENT: WHAT ILLINOIS STATE GOVERNMENT IS DOING ABOUT IT,
Illinois Environmental Protection Agency, Springfield.
For primary bibliographic entry see Field 06E.
W71-12166

CONTROL OF INDUSTRIAL WATER POLLUTION IN NEW MEXICO,
Gregory Pease.
Natural Resources Journal, Vol 9, p 653-670, 1969. 18 p, 74 ref.

Descriptors: *New Mexico, *Water quality control, *Industrial wastes, *Pollution abatement, Water pollution, Water pollution sources, Water pollution control, Treatment facilities, Water pollution treatment, Standards, Permits, Regulation, Administrative agencies, State governments, Administration, Industries, Sewage effluents, Effluents, Streams, Legislation, Supervisory control (Power), Legal aspects.

Industrial water pollution control in New Mexico is reviewed. Industry, the most troublesome source of pollution, is a relative newcomer to the state. As pollution is easier to prevent than abate, the state has an opportunity to preserve the high quality of its waters. Attraction of industry to the state, however, is a primary objective. Thus proposed water pollution controls must not seriously deter industry from locating in the state. The history of the state water pollution control legislation is discussed. The state Water Quality Act created the Water Quality Control Commission, whose composition, organization, and procedures are detailed. State water quality standards are comprehensive and regulate water quality conditions such as odor, floating solids, and toxic substances. In addition to promulgating stream standards, the Commission has adopted regulations relating to effluent discharges and specifications for proposed sewage systems. Implementation and enforcement of the standards and regulations are analyzed. The Commission has functioned smoothly, although its conglomerate nature is criticized, along with the lack of criminal penalties. A provision allowing variances from the regulations is the most problematic element in the present program. (Smiljanich-Florida)
W71-12167

FEDERAL WATER POLLUTION CONTROL ACT AS APPLIED TO THE CITY AND COUNTY OF HONOLULU,
B. F. Kaito.
Natural Resources Lawyer, Vol 1, No 1, p 70-76, 1968. 7 p.

Descriptors: *Hawaii, *Water pollution control, *Federal jurisdiction, *State jurisdiction, Water pollution, Water pollution sources, Water pollution effects, Pollution abatement, Legal aspects, Legislation, Federal government, State governments, Local governments, Water quality control, Standards, Interstate, Water policy.
Identifiers: Federal Water Pollution Control Act, Constitutionality.

There appears to be ample case law to sustain the constitutionality of the Federal Water Pollution Control Act as it applies to the mainland United States. This article, however, suggests that an examination of the Act's legislative history raises doubts about the legislation's constitutional foundations when the Act is applied to Hawaii. The commerce clause forms the Act's constitutional basis. By referring to the Act's declaration of policy and several statements made at legislative hearings, the author points out that Congress was primarily concerned with the continental United States. Other statements from the Act's legislative history emphasize that the Act was designed to apply to cases where interstate waters are involved. Furthermore, abatement should be a local matter where, as in Hawaii, no neighboring state can possibly be affected by water pollution. The author strengthens this interpretation by examining the Act's abatement and consent features. The author concludes that the Act not be applied to Hawaii and supports this viewpoint with specific facts relating to water pollution in the City and County of Honolulu. (Gallagher-Florida)
W71-12168

POLLUTION CONTROL: WHY HAS IT FAILED,
Arnold W. Reitze, Jr.
ABA Journal, Vol 55, p 923-927, 1969. 5 p, 45 ref.

Descriptors: *United States, *Pollution abatement, *Economics, *Water pollution control, Water pollution effects, Water pollution, Water pollution sources, Waste disposal, Legislation, Legal aspects, Leadership, Capital costs, Operating costs, Environmental effects, Industrial wastes.

At one time the destruction of our environment was merely an aesthetic problem. Now it threatens the survival of mankind as a species. With virtually every identifiable social or economic interest group contributing to the pollution problem, it is difficult to assign responsibility. There are three types of pollution control methods: informal, formal or legal, and economic. The informal methods are most capable of producing conformity to the demands of society. Legal controls operate to establish a minimum standard of acceptable conduct. Economic controls hardly exist. If pollution could be regarded as 'dirty' in the Victorian sense, then our problems would soon be solved. But this is not likely to happen. The acceptance of pollution is based on notions of a man-centered universe. Economic controls do not exist because control is expensive. Thus, pollution abatement is hampered by the astronomic costs of control. A committed citizenry is necessary if economic controls are to be implemented. Since economic considerations provide an incentive to pollute, only strong governmental constraints have any chance of success. Until Americans decide they want a livable environment, we cannot have one. (Shelnut-Florida)
W71-12170

WILL WE EVER HAVE CLEAN WATER,
B. Reid.
Environmental Action, p 3-5, March 20, 1971. 3 p.

Descriptors: *Water Quality Act, *Water pollution control, *Federal government, *Administrative agencies, State governments, Administration, Administrative decisions, Water quality, Water quality control, Regulation, Standards, Treatment facilities, Financing, Government finance, Legislation, Legal aspects, Remedies, Pollution abatement, Industrial wastes, Cities, Municipal wastes, Water pollution treatment, Wastewater (Pollution).
Identifiers: *Federal Water Pollution Control Act.

The first federal water pollution control legislation gave the federal government limited authority to abate pollution, and permitted the issuance of loans for construction of waste treatment facilities. A later act achieved federal enforcement by means of abatement conferences, public hearings, and litigation. In 1961, an amendment increased funding for the grant program and eliminated the necessity for state consent before beginning enforcement. The Water Quality Act of 1965 doubled funds for construction grants, created the Federal Water Pollution Control Agency, and required water quality standards. Since the appropriations provisions of the Water Quality Act expire June 30, 1971, Senator Muskie and the Nixon Administration have both proposed new legislation. Environmentalists favor the Muskie bill, while industry is attempting to water down the Nixon proposal. Ten items are listed for consideration by Congress: (1) emphasized effluent regulations, with a three year deadline to meet the standards; (2) required abatement proceedings on discovery of violations; (3) qui tam actions with the burden of proof upon defendant; (4) citizen suits; (5) a mandatory monitoring system; (6) assessment of user fees to industries using local treatment facilities on quantity and quality of wastes; (7) state standards to meet federal minimums; (8) use of best available technology; (9) 72-hour abatement orders; and (10) abolition of de novo court review. (Hart-Florida)
W71-12172

THE COORDINATED PROGRAM FOR THE WATER RESOURCES OF NEW YORK STATE.
New York State Water Resources Commission, Albany. Div. of Water Resources.
For primary bibliographic entry see Field 06B.
W71-12173

WATER QUALITY STANDARDS (INTERSTATE WATERS: ROCK RIVER, FOX RIVER, DES PLAINES RIVER, KANKAKEE RIVER, AND CERTAIN NAMED INTERSTATE TRIBUTARIES).
Illinois Sanitary Water Board, Springfield.

Rules and Regulations SWB-11, March 1968. 19 p, 1 map, 8 tab.

Descriptors: *Rivers, *Standards, *Water pollution control, Regulation, Pollution abatement, Administration, Administrative agencies, Permits, State governments, State jurisdiction, Water pollution, Water quality, Water quality control, Public health, Water pollution sources, Legal aspects, Waste disposal, Treatment facilities, Project planning, Water utilization.

This regulation prescribes the water quality standards that are deemed necessary to protect specified state waters for their designated public purposes. Variance from these standards shall be considered indicative of a polluted condition subject to abatement. Minimum conditions are promulgated that apply to all waters at all places and at all times. In addition, specific standards are established for sectors of the regulated waterways used for the following purposes: (1) public water supply and food processing, (2) aquatic life, (3) recreation, and (4) industrial water supply. Criteria include specific guidelines regulating levels of bacteria, dissolved solids, chemical constituents, radioactive substances, dissolved oxygen, pH and water temperature. Rules are established governing implementation and enforcement of this regulation by the Sanitary Water Board. Any waters presently higher in quality than the established standards must be maintained at such present high quality. General guidelines are established to deal with treatment facilities and effluent standards, as well as schedules for completion of water pollution control projects. The status of municipal waste facilities along the regulated waterways is shown by the use of eight tables. (Horwitz-Florida)
W71-12174

WATER QUALITY STANDARDS (INTERSTATE WATERS, MISSISSIPPI RIVER COMMON BOUNDARY BETWEEN ILLINOIS AND IOWA).
Illinois Sanitary Water Board, Springfield.

Rules and Regulations SWB-12, August 1968, 12 p. 1 map, 2 tab.

Descriptors: *Illinois, *Water quality control, *Standards, *Interstate rivers, Water pollution

control, Water pollution, Water pollution sources, Water pollution treatment, Pollution abatement, Treatment facilities, Pollutants, Hydrogen ion concentration, Turbidity, Bacteria, Toxicity, Temperature, Dissolved oxygen, Administrative agencies, Regulation, Legal aspects, Administration, Sewage effluents, Sewage treatment, Municipal wastes, Industrial wastes, Waste treatment.

Pursuant to previous water pollution abatement acts, the Sanitary Water Board herein adopts rules and regulations pertaining to water quality of selected interstate rivers. Minimum conditions are prescribed for all applicable waters. Bacteriological, radioactive and chemical criteria are detailed for public water supplies and the food processing industry. Criteria are also set forth for aquatic life and recreational use, including specific standards for: (1) dissolved oxygen, (2) pH, (3) temperature, (4) chemical constituents, (5) taste and odor, and (6) bacteria. Implementation and enforcement plans are described. All waters will be required to meet the standards for their appropriate water uses. Drastic or sudden temperature changes will not be permitted. Bimonthly water samples will be taken at selected locations to determine water quality. The certification of waste treatment plant operators is required. Specific effluent standards are described for sewage works. In some instances advanced waste treatment in excess of secondary treatment may be necessary. Municipal and industrial pollution abatement facilities must meet certain minimum standards. Project completion schedules are listed. A chart sets forth the status of municipal waste facilities. (Smiljanich-Florida)
W71-12175

WATER QUALITY STANDARDS (INTERSTATE WATERS, MISSISSIPPI RIVER BETWEEN ILLINOIS AND MISSOURI).
Illinois Sanitary Water Board, Springfield.

Rules and Regulations SWB-13, August 1968. 13 p, 1 map, 2 tab.

Descriptors: *Illinois, *Water quality control, *Standards, *Water pollution control, Pollution abatement, Water pollution, Pollutants, Water pollution sources, Administrative agencies, Regulation, Hydrogen ion concentration, Bacteria, Turbidity, Toxicity, Dissolved oxygen, Temperature, Treatment facilities, Water pollution treatment, Waste disposal, Waste treatment, Sewage treatment, Sewage effluents, Legal aspects, Municipal wastes, Industrial wastes.

Pursuant to previous water pollution abatement acts, the Sanitary Water Board herein adopts certain rules and regulations. Water quality criteria prescribe the qualities or properties of water which are necessary for designated public uses, and which, if the limiting conditions given are exceeded, shall be considered pollution conditions subject to abatement. General and specific criteria are given for designated zones. Stream standards are detailed for such properties as bacteria, pH, dissolved oxygen, temperature, toxicity, turbidity and floating solids. The Board is responsible for the control and prevention of water pollution. Implementation and enforcement plans are set forth. All waters will be required to meet the standards for the appropriate public and industrial water supply, aquatic life, recreational and agricultural uses. Drastic or sudden temperature changes will not be permitted. Bimonthly water samples will be taken at selected locations to determine water quality. Specific effluent standards are described for sewage works. Municipal and industrial pollution abatement facilities must meet certain minimum standards. Project completion schedules are listed. A chart describes the status of municipal waste facilities. (Smiljanich-Florida)
W71-12176

MUNICIPAL POWERS UNDER HOME RULE CHARTERS.
For primary bibliographic entry see Field 06E.
W71-12178

ENVIRONMENTAL PROTECTION ACT.
For primary bibliographic entry see Field 06E.
W71-12179

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

THE IMPACT OF IMPOSING A WATER QUALITY STANDARD ON A LIVE STREAM,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05G.
W71-11806

6B. Evaluation Process

DECISION PROCESSES IN WATER QUALITY MANAGEMENT,
Engineering-Science, Inc., Oakland, Calif. Research and Development Lab.
For primary bibliographic entry see Field 05G.
W71-11643

ECOLOGY AND RESOURCE ECONOMICS: AN INTEGRATION AND APPLICATION OF THEORY TO ENVIRONMENTAL DILEMMAS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 06G.
W71-11673

WATER FOR ILLINOIS, A PLAN FOR ACTION.
Illinois Technical Advisory Committee on Water Resources, Springfield.

Dept. of Business and Economic Development, State of Illinois, Springfield, March 1967. 452 p, 200 fig, 40 tab, 100 ref. HUD Grant.

Descriptors: *Planning, *Administration, *Water supply, *Water pollution control, *Urbanization, Cities, Programs, Illinois, Navigation, Recreation, Water law, Land management, Flood control, Water demand, Long-term planning.
Identifiers: *Water programs.

The first statewide plan for water that has been prepared by Illinois is described. Governor Otto Kerner endorsed the plan and submitted it to the State Legislature with the recommendation that the General Assembly adopt the report as a flexible plan for the long-range development and management of water resources in Illinois. The report is the foundation for water resources planning to the year 2020, and simultaneously is the basis for action in the immediate future--1968-1980. The Plan served as the basis for a huge bond issue approved by State voters for pollution control. The main headings of the report are: Illinois in Perspective, Water Resources, Water Supply and Use, Pollution and Pollution Control, Land and Water Management, Floods and Flood Control, Navigation, Water-related Recreation, and Laws and Government. The report contains many photographs in addition to tables and figures. A comprehensive series of reference lists are given at the end of each chapter. (Poertner)
W71-11797

MUNICIPAL WASTE TREATMENT WORKS CONSTRUCTION NEEDS.
State of Illinois Sanitary Water Board, Springfield.

April 1970. 40 p, 4 tab.

Descriptors: *Waste water treatment, *Treatment facilities, *Sewage treatment, *Water pollution control, Construction costs, Planning, Long-term planning, Illinois, Municipal wastes, Cities, Urbanization, Programs.
Identifiers: *Construction needs, *Municipal waste treatment works.

Part of the Sanitary Water Board's plan for wate pollution control in Illinois is outlined. It outline municipal waste treatment works constructio needs to meet minimum stream water quality star dards. The estimated costs of these required facil ties are also presented in the report. The materia was extracted from the annual program plan sub mitted to the Federal Water Pollution Contro Agency by the Sanitary Water Board in accordanc with the provisions of Federal Public Law 84-660 One table lists treatment works needs with stat estimates of minimum construction costs. This list ing is in three parts: cities and villages, downstat sanitary districts, and the Metropolitan Sanitary District of Greater Chicago. The list represents a total construction cost of approximately $360,307,250 for the 488 projects included Another table lists municipalities that have filed fo federal grants for construction of additions, im provements or new sewage treatment facilities These are all voluntary applications but most are in recognition of waste treatment needs. A third table reflects recent trends in applications for federa grants and appropriations of the U. S. Congress. A fourth table contains estimates of the dollar needs by counties for sanitary sewers and treatment facili ties through 1980. (Poertner)
W71-11803

INVESTIGATION OF THE FEASIBILITY OF THE DEVELOPMENT OF A WATER RESOURCES MANAGEMENT MODEL FOR THE HIGH PLAINS AREA OF OKLAHOMA,
Oklahoma State Univ., Stillwater. Dept. of Civi Engineering.
For primary bibliographic entry see Field 02F.
W71-11860

SCIENTIFIC PRINCIPLES OF THE COMPLEX UTILIZATION AND CONSERVATION OF WATER RESOURCES,
Akademiya Nauk SSSR, Moscow. Institu Geografii.
M. I. L'vovich.
Soviet Geography: Review and Translation, Vol 10 No 3, p 95-118, March 1969. 2 tab.

Descriptors: *Water resources, *Hydrologic cycle *Pollution abatement, *Water conservation *Planning, Administration, Water consumption (Excludes consumptive use), Consumptive use Waste storage, Waste water treatment, Waste water disposal, Water uses.
Identifiers: *USSR.

Current water consumption and the irrational use of water from various sources is reviewed. In the Soviet Union, miscalculations in water usage and conservation result from many sources, but the most important are the absence of an interagency planning organization, a uniform national set o rules or policy, and national water legislation. Step have been taken to improve the situation but it i stressed that the consequences of many years o neglect cannot be eliminated on short notice. The world hydrologic budget is reviewed and it is see that, if properly used, the total world water availa ble to man is enormous. An annual balance sheet o U.S.S.R. water resources is constructed and each component is described. The most unstable ele ment is surface water, and a number of agronomi methods for its conservation and reduction in con sumption are listed. Unfortunately, qualitativ destruction (pollution) of pure water is equivalen to reduced quantitative availability. One cubi meter of wastes spoils at least 50-60 cubic meter of pure natural water. Various proposed method for increasing available water or diluting pollute water are reviewed and dismissed as impractical. A series of steps are outlined, involving waste treat ment and waste water recycling processes, tha would reduce pollution and increase pure wate resources manyfold. The author argues for th training of people capable of dealing with the entir water resource picture, instead of narrow spe cialists. (Casey-Arizona)
W71-12107

THE COORDINATED PROGRAM FOR THE WATER RESOURCES OF NEW YORK STATE.
New York State Water Resources Commission, Albany. Div. of Water Resources.

June 1966. 79 p, 4 maps, 16 charts, 4 append.

Descriptors: *New York, *Water resources development, *Planning, *Interstate compacts, Water resources, Administrative agencies, Legislation, Water law, Water pollution, Water pollution control, Research and development, River basin development, State governments, Water conservation, Water policy, Water management (Applied), Water quality, Water quality control, Interstate commissions, Delaware River Basin Commission, River basin commissions, Interstate rivers.

The administrative structure created by New York to plan, develop, and manage its water resources is described in this pamphlet. The sixteen agencies and sub-agencies responsible for water resources management are first described. Each agency's function, membership, organization, and facilities are delineated. Furthermore, the following interstate compacts in which New York is involved are discussed: (1) Delaware River Basin Commission, (2) Ohio River Valley Sanitation Commission, (3) New England Interstate Water Pollution Control Commission, (4) Lake Champlain Basin Commission, (5) Great Lakes Commission, (6) Interstate Sanitation Commission, and (7) Susquehanna River Basin Interstate Advisory Committee. New York's current planning programs are divided into two types: (1) comprehensive planning studies, and (2) framework studies. The use of these studies by regional boards is discussed, along with joint planning studies being conducted on various river basins. State framework studies are also described. New York legislation for water pollution control is considered, as well as water resources research. The pamphlet also contains several appendices, maps, and charts. (Hart-Florida)
W71-12173

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

FINANCING ENVIRONMENTAL QUALITY, THE MUNICIPAL INITIATIVE,
Bank of America, San Francisco, Calif.
Alan K. Browne.
Ninety-first Annual Conference, American Water Works Association, Denver, Colorado, June 13-18, 1971. 12 p.

Descriptors: *Financing, *Capital, *Investment, *Planning, Taxes, Water quality, Administration, Utilities, Municipal water, Cities, Economics, Environmental engineering.
Identifiers: *Municipal financing, General obligation bonds, Commercial banks.

The problem is dealt with of financing environmental quality programs. The principal burden of financing environmental quality will, in the present scheme, fall on local governments. The least expensive method of long term financing is the general obligation bond. Its use invariably requires an affirmative vote of the people for issuance. Most bond-financed, undertakings of an environmental nature will be in the public utility area, including water, sewer, and power enterprises. Where such undertakings are financed by general obligation bonds, user rates may be set at levels sufficient to meet debt service plus whatever surplus is desired for capital outlays, sinking funds, or reserves. Revenue bonds are limited for debt service payments solely to the income of the specific enterprise and, for this reason, security provisions must be more stringent. Congressional efforts to allow commercial banks to underwrite water and sewer bonds should be supported. This would contribute to higher bidding and reduce finance costs for revenue bond issues. Many financing plans concerned with enhancing environmental quality will probably require a restructuring of local governments along regional lines or the use of intergovernmental agreements. (Poertner)
W71-11799

COSTING THE SYSTEM DESIGN ALTERNATIVES,
Department of the Navy, Washington, D.C. ADPE Selection Office.
E. O. Joslin.
Data Management, Vol 9, No 4, p 23-27, Apr 1971. 5 p, 1 fig.

Descriptors: *Systems analysis, *Cost analysis, *Computers, Equipment costs, Benefit-cost analysis, Feasibility studies, Computer systems programs, Systems engineering, Labor costs, Costs, Computer systems hardware, Data processing, Computer programming, Financing.
Identifiers: *Alternatives.

Costing the system design alternatives in a computer system study requires consideration of the proper cost items and examination of the possible design alternatives. Important cost items can be grouped into 6 categories; equipment, programming, personnel, outside services, finance charges, and other applications. The cost items can be apportioned to each application, or considered in their entirety for a complete system or group of applications. Design alternatives that should be examined include: the present system, various financial arrangements, modifications to the present system, augmentations of the present system, and a new system. The system design alternatives developed in a system study only take on real meaning when the cost of each alternative can be compared to its benefits, and when the cost and benefits of each alternative can be compared. From this type of costing of the system design alternatives, management can decide which alternative will serve their needs best. (USBR)
W71-11821

ECONOMIC ANALYSIS OF IRRIGATION IN SUBHUMID CLIMATE,
Montana State Univ., Bozeman. Dept. of Economics; and Montana State Univ., Bozeman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 03F.
W71-12116

WATER DEPLETION TAX ALLOWANCE MAPS.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.

Cross Section, Vol 16, No 12, December 1970, p 1, 3.

Descriptors: *Taxes, *Maps, *Economic impact, *Evaluation, *Groundwater mining, Value, Legal aspects, Irrigation practices, Automation, Hydrologic data, Texas, Water supply.
Identifiers: *Tax allowance, Texas High Plains, High Plains Underground Water Conservation District (Tex).

The Internal Revenue Service authorized the same cost-in-water values for land purchased in 1969 to be used in 1970. The High Plains Underground Water Conservation District No. 1 is automating the processing of cost-in-water depletion income-tax-allowance program. Claimants may file for allowance by providing the District with an IRS Form 665, showing the land location on the 1969-decline map, or listing legal descriptions of land parcels. The IRS allowance applies to land owners on the semi-arid Texas High Plains where groundwater is mined to produce economic crops by irrigation. (Popkin-Arizona)
W71-12133

IMPORTANT I.R.S. DETERMINATION.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 03F.
W71-12141

6D. Water Demand

ANALOG MODEL STUDY OF THE GROUNDWATER BASIN OF THE UPPER COACHELLA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04B.
W71-11752

WATER RESOURCES RESEARCH AND CALIFORNIA'S FUTURE.
California Univ., Los Angeles, Water Resources Center.

Report No 22, 1971. 20 p, 1 tab.

Descriptors: *Water resources development, *California, *Research and development, *Water supply, *Water balance, Hydrology, Surface waters, Groundwater, Forecasting, Project planning, Programs, Water quality, Water yield.
Identifiers: *Water resources research, Projection.

If the State of California is going to deal effectively with some of the difficult water needs and problems which it will face in the years ahead, then greater reliance will have to be placed upon research. Undergirding much of California's water development enterprise to date has been a substantial research program, much of it emanating from educational institutions; but this research program now needs to be intensified, expanded, and broadened. Greater numbers of researchers, more interdisciplinary involvement and more financial investment will be necessary if the State's progress is to be assured. Methods for developing these needs are discussed. (Woodard-USGS)
W71-11788

WATER FOR ILLINOIS, A PLAN FOR ACTION.
Illinois Technical Advisory Committee on Water Resources, Springfield.
For primary bibliographic entry see Field 06B.
W71-11797

THE LAND USE MASTER PLAN OF THE EAST BAY MUNICIPAL UTILITY DISTRICT.
East Bay Municipal Utility District, Oakland, Calif.

August 14, 1970. 33 p, 3 fig.

Descriptors: *Planning, *Watershed management, *Reservoirs, *Recreation, *Water utilization, Arable land, Education, Public benefits, Income, Administration, California.
Identifiers: *East Bay Municipal Utility District, Oakland (Calif).

Over the years a series of transactions left the East Bay Municipal Utility District the owner of more than 54,540 acres of land including 12,765 acres of water surface. Public demand for recreation access brought the opening of Pardee Reservoir in 1958, Lafayette and Chabot reservoirs in 1966, and Camanche Reservoir in 1967. In April 1969, the Board of Directors of the District approved a policy statement setting guidelines for land management, and authorized preparation of a master plan and appointment of a citizens advisory committee. The policy statement provided: the primary purpose of the lands was water production and distribution, and that all other uses must be compatible with this primary purpose; stressed the importance of preserving the lands as open space; and indicated preferences for developing public access and funding the developments. Implementation of the plan will proceed as District staff and funding resources permit. Recreation sites will be developed and educational areas will be made available in accord with timetables and priorities which will be determined in recreation and educational services management plans. Maps and a description of the five major categories of land usage are included. (Poertner)
W71-11800

INTERIM REPORT, AWWA WATER USE COMMITTEE,
American Water Works Association, New York.
William L. Patterson.
Ninety-first Annual Conference, American Water Works Association, Denver, Colorado, June 13-18, 1971. 13 p.

Descriptors: *Water utilization, *Municipal water, *Industrial water, *Water demand, Water rates, Planning, Climatology, Population, Rainfall, Temperature.

This report is directed towards two main objectives. One is to assess current trends in water use and the factors influencing the trends. The other is to review the 1966 Johns Hopkins University residential water use research report for practical application in estimating average and peak residential water use. Annual residential water use per customer was increasing in less than half the cases reviewed, and there was decreasing use in 8 per cent. Commercial use per customer shows an increasing trend for all utilities studied. One of the most obvious reasons for the reduction of growth in water use per residential customer is that the purchase and use of major water using appliances may have reached a saturation level in many communities. Some other factors are: changes in urban area occupancy and land use, changes in the local economic climate, inability of utilities to expand their service areas, substantial rate increases, changes in the basis of billing, restrictions on water use, and changes in the relative size and makeup of various customer classes. The Johns Hopkins method may offer a general guide for estimating the approximate water requirements of a new residential area of limited size. However, this review indicates that its applicability for estimating the total future residential water requirements of a particular city or community, for pur.poses of design, may be subject to question. (Poertner)
W71-11801

A REPORT ON THE MARKET FOR WATER QUALITY CONTROL.
U.S. News and World Report, Inc., Washington, D.C. Market Research Div.

February 1967. 77 p, 10 tab, 8 fig, 11 ref.

Descriptors: *Water quality, *Water quality control, *Equipment, *Instrumentation, *Surveys, Water supply, Water consumption, Financing, Planning, Waste water treatment, Industrial water, Municipal water, Irrigation.
Identifiers: *Market research, *Pollution control market, Manufactured products, Process equipment.

The market for water quality control is outlined in the terms of water use and consumption, sources and types of pollution, and methods of treatment. Also discussed are roles of the Federal, State, and Municipal governments in establishing and enforcing adequate water quality standards and in financing research, development, and construction of improved water treatment facilities. Detailed breakdowns for water supply and wastewater systems are included, along with market projections for certain sectors of the industry. A case history of Kansas City's pollution abatement program is included as is a listing of major suppliers of the water supply and wastewater industries. (Poertner)
W71-11805

IN A DISASTER: THE ROLE OF GROUNDWATER.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 04B.
W71-12104

AN ANALYSIS OF MUNICIPAL WATER DEMAND IN THE PHOENIX METROPOLITAN AREA,
Arizona State Univ., Tempe. Coll. of Business Administration.
John Marston Bruner.
Doctoral Dissertation, Arizona State University, 188 p, June 1969. 20 fig, 23 tab, 113 ref. OWRR A-013-Ariz (2).

Descriptors: *Municipal water, *Water consumption, *Water demand, *Water costs, Arizona, Cost-benefit analysis, Model studies, Water resources development, Planning, Arid lands, Water users.
Identifiers: *Potential evapotranspiration.

A spatial-time analysis was made of demand for water in the Phoenix metropolitan area in an effort to provide possible solutions to its water problems, brought on by increasing population, declining groundwater levels, substantial seasonal variation in water consumption, and the emotional biases associated with water in an arid environment. Major concern centers around the augmentation of existing water supplies (e.g. Central Arizona Project). It was found that consumers tend to adjust water use with changes in income levels as well as with changes in the marginal price paid, but it is believed that price increases would be of limited usefulness in restricting water consumption at existing rate levels if other factors held constant. However, price increases could be associated with increases in revenue to the water system. If these data accurately reflect consumer behavior in the water market, they could facilitate water system planning. In addition to a description of the institutional framework of the present municipal water systems in the area, there is an assessment of the variations in municipal water use and the factors influencing municipal water demand and use; and finally an analysis of potential evapotranspiration as a consumptive factor peculiarly critical for an arid environment. The author recommends as further study needs an analysis of factors influencing public demand for water (fire protection, recreation, etc.), commercial demands, and residential demands; and an analysis of the impact of land use on water consumption. (Paylore-Arizona)
W71-12114

NWWA DISASTER COMMITTEE.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 04B.
W71-12127

WATER POLLUTION CONTROL AT PHILLIPS PUERTO RICO PETROCHEMICAL COMPLEX,
Phillips Puerto Rico Core Inc., Guayama.
For primary bibliographic entry see Field 05D.
W71-12206

6E. Water Law and Institutions

DECISION PROCESSES IN WATER QUALITY MANAGEMENT,
Engineering-Science, Inc., Oakland, Calif. Research and Development Lab.
For primary bibliographic entry see Field 05G.
W71-11643

CALIFORNIA OIL CO V DAVENPORT (OIL LESSEE'S STRICT LIABILITY FOR THE POLLUTION OF WATER USED FOR LIVESTOCK).

435 P2d 560-565 (Okla 1967).

Descriptors: *Oklahoma, *Oil wastes, *Water pollution effects, *Cattle, Judicial decisions, Legal aspects, Oil wells, Drilling, Water pollution sources, Water pollution, Water pollution control, Remedies, Livestock, Legislation, Well regulations, Surface runoff, Drilling fluids, Poisons, Oil industry, Leases, Contracts.

Plaintiff agricultural lessee sought damages from defendant oil and gas lessee, whose lease covered the same land, for injury to plaintiff's cattle allegedly caused by poisonous runoff from drilling operations. Plaintiff's action was based on a strict liability statute which required oil well operators to prevent substances from escaping into any tank, pool, or stream used for watering stock. Defendant contended that the statute did not apply since his well was not yet producing. Defendant also asserted that a release obtained from plaintiff encompassed the injuries alleged by plaintiff. The Supreme Court of Oklahoma held that an oil well not yet producing is within the purview of a statute imposing strict liability for allowing inflammable products to run into any tank, pool, or stream used for watering stock. The court ruled that the release given by plaintiff applied only to that portion of the land reasonably necessary for the location, development, and completion of defendant's well, and that it did not encompass damages on other portions of the land. The court affirmed the jury's verdict for plaintiff. (Gallagher-Florida)
W71-11652

CONLEY V AMALGAMATED SUGAR CO (PROOF OF BUSINESS DAMAGES CREATED BY STREAM POLLUTION ODOR).
263 P2d 705-710 (Idaho 1953).

Descriptors: *Idaho, *Water pollution sources, *Odor, *Damages, Water pollution, Sugar beets, Industrial wastes, Waste disposal, Pollution abatement, Water pollution control, Water pollution effects, Pollutants, Pulp wastes, Organic wastes, Water quality, Remedies, Industries, Estimated costs, Income, Legal aspects, Judicial decisions, Streams, Downstream.

Plaintiff grocer sued defendant sugar beet factory to recover damages arising from pollution of a stream. Plaintiff contended that defendant dumped beet pulp into a stream, thereby creating an offensive odor downstream which caused plaintiff to suffer business losses. Defendant contended that other pollution sources created the nuisance, and that plaintiff had failed to adequately show that his business loss was directly attributable to the odor from the stream. In affirming a trial court judgment for plaintiff, the Supreme Court of Idaho noted that no odor from the stream was present before defendant commenced operation. Damages resulting from stream pollution may be awarded even though it is difficult to determine an exact amount of damages. It is for the trier of fact to fix the amount of damages. Where there is substantial evidence, regardless of conflict, to sustain such findings, an appellate court must affirm the trial court. Proof of prior annual income of the grocery was correctly used in demonstrating the business loss attributable to the pollution. (Smiljanich-Florida)
W71-11653

FREEL V OZARK-MAHONING CO (DAMAGES RESULTING FROM STREAM POLLUTION).
208 F Supp 93-99 (D Colo 1962).

Descriptors: *Colorado, *Water pollution sources, *Mine wastes, *Damages, Water pollution, Water pollution control, Pollution abatement, Mine drainage, Mineral industry, Mining, Ponds, Pollutants, Dams, Flood damage, Flooding, Legislation, Land tenure, Streams, Judicial decisions, Legal aspects, Remedies, Legislation.

Plaintiff landowner sued defendant mining company for damages resulting from pollution of a stream and flooding of plaintiff's property. Plaintiff contended that defendant failed on various occasions to contain their mine tailings as a result of failure of the walls surrounding the tailings ponds. Plaintiff also requested punitive damages for defendant's intentional pollution of the stream. Defendant denied liability and claimed that no damages were sufficiently proved. The United States District Court for Colorado awarded damages to plaintiff for injury to his property, but disallowed punitive damages. The court noted that under state statutes the defendant was liable for the stream pollution and the contamination and flooding of plaintiff's land regardless of negligence or intention. The correct measure of damages is the difference in market

value before and after the injury, but where evidence of market value is insufficient, cost of repairs may be looked to for evidence of monetary damages. Evidence was sufficient to show some damage to plaintiff's land, but was insufficient to show that substantial monetary damage resulted from defendant's conduct. Punitive damages were therefore not warranted. (Smiljanich-Florida)
W71-11657

AN ACT RELATIVE TO THE DISCHARGE OF MERCURY INTO WATERS OF THE STATE.
Public Laws of Maine, 1971, ch 372, Maine Legislative Service, p 440.

Descriptors: *Water quality control, *Maine, *Water pollution control, *Water pollution sources, Pollutants, Water pollution effects, Water policy, Public health, Inland waterways, Tidal waters, Organic compounds, Inorganic compounds, Industrial wastes, Waste disposal, Legislation, Administrative agencies, Regulation, Standards.
Identifiers: *Mercury discharges.

The discharge of mercury compounds into the waters of Maine, inland and tidal, is prohibited by this statute. No person, firm, corporation, or other legal entity shall place, deposit, discharge, or spill into state waters, the ice thereof, or the banks thereof mercury or any compound containing mercury. Any firm, corporation, legal entity, or person that on January 1, 1971, was discharging mercury in connection with an industrial process shall not be in violation of this Act if on or before December 31, 1971, it shall file a statement indicating the amount discharged. The commission, however, upon finding a concentration of 10 parts per billion of mercury or greater present in state waters, or a lesser concentration that is endangering public health, may issue an emergency order. The order shall prohibit or curtail discharges of mercury or compounds containing mercury. (Rees-Florida)
W71-11663

SITE LOCATION OF DEVELOPMENT.

Maine Revised Statutes Ann tit 38, secs 481 thru 488 (Supp 1970).

Descriptors: *Maine, *Industrial plants, *Locating, *Environmental effects, Industries, Sites, Environmental sanitation, Soil environment, Bodies of water, Public health, Administrative agencies, Regulation, Permits, Standards, Natural resources, Excavation, Drilling, Water supply, Solid wastes, Waste disposal, Land use, Legislation, Environmental engineering, Water pollution control.

In order to minimize the adverse impact of commercial and industrial developments upon the local environment, this Act regulates the location of such projects. The Act defines the persons, developments, and environmental uses covered by the Environmental Improvement Commission's implementation of the Act. Notification of the Commission is required before commencing the construction or operation of a development. The Commission has 14 days to approve or deny the proposed location, and it may hold hearings to determine the development's environmental consequences. The Commission in approving a development shall consider its: (1) financial capacity; (2) traffic movement; (3) environmental effect; and (4) soil types. Within 45 days after a hearing the Commission shall issue its order granting or denying approval of the proposed site. A failure to notify the commission may result in a suit for injunction brought by the Attorney General. All orders of the Commission are enforceable by the Attorney General, who shall initiate civil proceedings upon failure to obey such orders. The Act provides for the judicial review of Commission hearings. (Rees-Florida)
W71-11667

AID TO MUNICIPALITIES FOR WATER SUPPLY, POLLUTION ABATEMENT AND SEWER SEPARATION.
Vermont Stat Ann tit 10, secs 1201 thru 1253 (Supp 1971).

Descriptors: *Vermont, *Local governments, *Financing, *Pollution abatement, Sewage treatment, Administrative agencies, Legislation, State governments, State jurisdiction, Legal aspects, Supervisory control (Power), Standards, Water pollution, Grants, Sewage disposal, Water quality control, Water supply, Water pollution treatment, Waste water disposal, Waste water treatment, Treatment facilities, Construction, Project planning.

Specifications are herein established to guide the Environmental Conservation Agency in aiding municipalities in the areas of water supply, pollution abatement, and sewer separation. Municipalities desiring to develop engineering plans for potable water supply facilities, water pollution abatement facilities, or combined sewer separation facilities may apply to the Department of Water Resources for an advance of the funds needed for such plans. Provisions dealing with engineering planning advances relate to: (1) applications, (2) advance awards, (3) award payments, (4) advance repayments, (5) priorities and limitation determinations by the Department, (6) appeals to the Water Resources Board by dissatisfied municipalities, and (7) regulatory authority. A municipality desiring state assistance grants for the construction, improvement, or expansion of water supply, water pollution, or sewer separation facilities may apply to the Department for such grants under rules herein established. The Act establishes guidelines for construction grants-in-aid which deal with: (1) applications, (2) awards for water supply projects, (3) awards for pollution abatement, (4) awards for combined sewer separation projects, (5) award payments, (6) priorities, and (7) appeals by dissatisfied municipalities. (Horwitz-Florida)
W71-11675

REGIONAL WASTE DISPOSAL ACT.
Texas Civil Statutes Ann art 7621 g (Supp 1970).

Descriptors: *Regional analysis, *Texas, *Water pollution control, *Water quality control, Waste disposal, Waste treatment, Legislation, Legal aspects, Waste water disposal, Water pollution treatment, Sewage, Municipal wastes, Domestic wastes, Industrial wastes, Sewage treatment, Government finance, Financing, Administrative agencies, Water quality, River basin development, Watersheds (Basins), Planning, River basins.

Each Texas river authority is herein authorized to prepare regional plans for water quality management, control, and abatement of pollution in its river basin and adjoining coastal basins. Such plans must provide for: (1) consistency with applicable water quality standards; (2) disposal systems providing the most effective and economical means for the collection, storage, treatment, and purification of waste; and (3) the maintenance and improvement of basin water quality standards and methods of financing necessary facilities. The authority and powers of districts are herein detailed. Public agencies may contract with districts for the use of disposal systems. Payments by public agencies for such services may come from ad valorem property taxes or service charges. Districts may issue bonds for the purpose of acquiring, constructing, improving, enlarging, extending, and repairing disposal systems. The requirements for issuing such bonds are specified herein. This act is cumulative of other statutes relating to such matters and is not in derogation of any existing powers of any district or public agency. (Robinson-Florida)
W71-11681

PRIVATE WASTE DISPOSAL.
For primary bibliographic entry see Field 05G.
W71-11688

UNITED STATES V MAPLEWOOD POULTRY CO (DISCRIMINATORY PROSECUTION FOR ILLEGAL REFUSE DISCHARGE).
320 F Supp 1395-1396 (D Me 1970).

Descriptors: *Maine, *Water pollution control, *Waste disposal, *Industrial wastes, Legal aspects, Judicial decisions, Water pollution sources, Bays, Water quality, Water quality control, United States, Federal government, Federal jurisdiction.

Plaintiff United States obtained an indictment against defendant poultry processors for the illegal discharge of refuse into the waters of a bay. Defendants had discharged animal blood, fat, entrails, and chicken feathers. Defendants moved to dismiss the indictment on grounds that it constituted discriminatory, selective enforcement. Defendants proved that they were the only two entities, of a number of industrial concerns discharging refuse in the same bay and river, against which plaintiff had initiated criminal prosecutions. It was not proven, however, that the prosecutions were deliverately arbitrary, illegal, or otherwise unjustifiable. Hence, the federal district court denied defendants' motion to dismiss. (Hart-Florida)
W71-11689

NELSON V C AND C PLYWOOD CORP (STATUTE OF LIMITATIONS AND THEORIES OF LIABILITY FOR POLLUTING UNDERGROUND WATER).
465 P2d 314-326 (Mont 1970).

Descriptors: *Montana, *Water pollution sources, *Water wells, *Remedies, Industrial wastes, Water pollution, Pollution abatement, Water pollution effects, Pollutants, Waste disposal, Groundwater, Percolating water, Percolation, Path of pollutants, Wood wastes, Pulp and paper industry, Damages, Hydrologic data, Legislation, Land tenure, Legal aspects, Judicial decisions, Wells.

Plaintiff landowner sued defendant corporation for damages for the pollution of his well by defendant's plywood operation. Plaintiff contended that the defendant's dumping of glue wastes into the ground polluted his well and rendered it unfit for use. Defendant contended that the trial judge incorrectly instructed the jury on both negligence and private nuisance, an adjoining land-owner is not responsible for damage to the percolating water of a neighbor, and the statute of limitations had run on a permanent nuisance. In affirming a verdict for plaintiff, the Supreme Court of Montana held that theories of negligence and private nuisance are both applicable to underground water pollution, and that due to advances in hydrological science, underground water pollution can be proven and is thus actionable. The court also ruled that where a private nuisance is temporary and continuous in character, actual damages create separate causes of action. Thus, a recovery may be had for damages accruing within the statutory period next preceding the commencement of the action. The pollution of groundwater by the dumping of glue wastes is such a continuing, temporary nuisance. (Smiljanich-Florida)
W71-11692

ENFORCEMENT LIMITATIONS IN WATER QUALITY CONTROL,
Federal Water Quality Administration, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-11693

SHELL OIL CO V BLUBAUGH (DEGREE OF PROOF NECESSARY TO SUSTAIN PERMANENT DAMAGES FOR THE POLLUTION OF A WATER WELL BY ADJOINING OIL WELL OPERATORS),

185 P2d 959-962 (Okla 1947)

Descriptors: *Water pollution, *Oil industry, *Oklahoma, *Water wells, Salinity, Oily water, Oil

wastes, Oil wells, Pollutants, Impaired water quality, Water pollution, Damages, Remedies, Judicial decisions, Legal aspects, Water pollution sources, Real property, Land tenure, Oil fields.

Plaintiff landowner filed this action against defendant oil companies seeking damages arising from the pollution of plaintiff's two water wells. Defendants operated oil wells approximately one-half mile from plaintiff's water wells. Plaintiff contended that by reason of defendants' improper plugging of certain abandoned wells, oil and salt water had escaped into the water source on his land. As a result, plaintiff's wells were polluted and his land permanently injured. Defendants contended that there was no proof that plaintiff's wells had been polluted. The Supreme Court of Oklahoma held that in order to recover for the pollution of a water supply by an adjoining oil well operator plaintiff must establish a causal connection between the violation complained of and the injury sustained. The court vacated the judgment for plaintiff on grounds that the evidence showed that whatever the source of the oil in plaintiff's well, it had been pumped from the well and thereafter plaintiff's well had produced neither salt water nor oil. The court ruled that the pollution of plaintiff's well was therefore temporary and could not be used as a basis of permanent damages to the realty. (Shelnut-Florida)
W71-11695

ATKINSON V HERINGTON CATTLE CO (FEED LOT OPERATOR'S AND CATTLE OWNER'S JOINT LIABILITY FOR CATTLE WASTE RUNOFF).
436 P2d 816-828 (Kan 1968)

Descriptors: *Cattle, *Waste water (Pollution), *Damages, *Kansas, Water pollution sources, Farm wastes, Pollution abatement, Surface runoff, Water pollution effects, Water pollution control, Remedies, Legal aspects, Judicial decisions, Livestock, Stock water, Water supply, Water wells, Coliforms, Sewage bacteria, Nitrates.

In an action for damages arising from the pollution of plaintiff dairy farm owner's water supply by defendant cattle rancher's feeding operations, the Kansas Supreme Court held that the evidence was sufficient to support a judgment for actual, but not punitive, damages. The court agreed with plaintiff's contention that there was ample evidence to find that the waters of a creek and plaintiff's well were contaminated with coliform bacteria and nitrates following a runoff of rains from defendant's premises. The supreme court construed the lower court's ruling to mean that runoff becomes a harmful substance when it consists of contaminating bacteria and chemicals in such amounts as to produce excessive pollution which results in injury. The fact that a business is lawful does not exempt it from liability when contaminated or polluted water escapes onto the land of another in such quantities as to cause injury. The owner of the cattle being fed by defendant rancher was held jointly and severally liable since the bailment contract with defendant rancher vested essential control over the operation in the cattle owner-bailor. (Gallagher-Florida)
W71-11700

SEWAGE, WATER, AND GARBAGE DISPOSAL DISTRICTS.
Nevada Revised Statutes secs 310.010 thru 310.180 (1965).

Descriptors: *Nevada, *Water districts, *Sewage districts, *Adoption of practices, Water sources, Administration, Administrative agencies, Standards, State governments, State jurisdiction, Local governments, Legal aspects, Public health, Sewage treatment, Sewage disposal, Pollution abatement, Water quality control, Water pollution sources, Supervisory control (Power), Project planning, Financing, Domestic wastes, Water supply, Waste disposal, Non-structural alternatives.

The board of county commissioners of each county shall be the sanitary board for the county in which the county commissioners hold office. Each sanitary board is given the power to establish sewage districts, water districts, and garbage disposal districts whenever the public health and sanitation of the county or any portion thereof would be promoted. The board is given the authority to set district boundaries in any manner deemed to be most beneficial. A district may comprise a section of a county or the entire county and may be combined with any existing districts. Sanitary boards are given the power to acquire property by eminent domain proceedings whenever it is necessary to implement district plans. Each sanitary board shall adopt a comprehensive plan encompassing a system of sewers, water system or garbage disposal system adequate for such district. Such plans are to be approved by the county engineer and Health Division of the Department of Health. The statute further specifies additional powers of the districts, methods of financing, and the execution of bonds for projects approved by a board. (Horwitz-Florida)
W71-11707

PROHIBITION AND PENALTY FOR THE POLLUTION OF WATERING HOLES USED BY WILD HORSES.
Nevada Revised Statutes secs 569.420, 569.430 (1961).

Descriptors: *Nevada, *Water holes, *Water pollution control, *Wildlife conservation, Legislation, Legal aspects, Water law, Water quality control, State governments, Water pollution sources, Animals, Animal control, Preservation, Natural resources, Water utilization, Water pollution effects.

It shall be unlawful for any person to pollute watering holes in order to trap, kill, wound, or maim any wild horse, mare, colt or burro. Any person violating this provision shall be guilty of a misdemeanor, and on conviction thereof shall be punished by a fine of not less than $20, nor more than $500, or by imprisonment in the county mail not exceeding six months, or by both fine and imprisonment. (Johnson-Florida)
W71-11710

STATE WATER POLLUTION CONTROL BD V SALT LAKE CITY (LIMITATIONS ON BOARD CONTROL OVER CITY SEWAGE SYSTEM).
311 P2d 370-376 (Utah 1957)

Descriptors: *Utah, *Sewage disposal, *Local governments, *Regulation, State governments, State jurisdiction, Administration, Administrative agencies, Supervisory control, Pollution abatement, Water pollution control, Water pollution sources, Water quality control, Legal aspects, Judicial decisions, Treatment facilities, Sewage treatment, Waste disposal, Water pollution treatment, Water policy, Legislation.

Plaintiff city was charged with violating rules set forth by defendant water pollution control board, and was ordered to discontinue such practices at a hearing from which plaintiffs sought court review and reversal. Plaintiff was charged with three violations which concerned: (1) maintaining a cross-connection between a drinking water system and a sewage system, (2) using public sewer pipes less than eight inches in diameter, and (3) maintaining an underground pump station without mechanical ventilation. Plaintiff contended that the board regulation constituted an unreasonable intrusion into the internal affairs of local government, in violation of the state constitution. Plaintiff justified its actions by claiming that no pollution would result and that the regulations were unreasonable. The trial court reversed the board's order and on appeal the Supreme Court of Utah affirmed the trial court's decision. The court held that the board had no jurisdiction over the city's sewer system unless it was conducted in a manner which threatened pollution of waters beyond the confines of the city. The maintenance of a sewer system was deemed a proper function of the city and therefore constitutionally protected. (Horwitz-Florida)
W71-11711

MID-CONTINENT PIPE LINE CO V EBERWEIN (Pollution of Farm Water Supply from Oil Pipe Line Leakage).
333 P2d 561-564 (Okla 1958).

Descriptors: *Oklahoma, *Water pollution sources, *Oil, *Damages, Judicial decisions, Remedies, Legal aspects, Pollution abatement, Pipelines, Water pollution control, Oil wastes, Oil industry, Oily water, Water supply, Water quality, Water pollution, Water law, Relative rights, Riparian rights, Water rights.

Plaintiff farm owners sought to recover damages for permanent injury to their land resulting when crude oil escaped from defendant's pipe line, which extended across plaintiffs' land, and permanently destroyed the farms' water supply. Plaintiffs alleged that the damages were permanent and resulted from the oil leaking from the defendant's pipe line. Defendant sought reversal of a jury verdict for plaintiff upon three grounds: (1) plaintiff did not adduce evidence of the value of the land immediately before and after the injury; (2) there was no showing of negligence and, therefore, there could be no liability; and (3) the escape of the oil was unavoidable accident. The Supreme Court of Oklahoma modified the judgment by requiring a remittitur or a new trial. The court held that plaintiffs did not show the value of the land immediately after the pollution, but at the time of the trial, which was two years later. The fact that a large quantity of oil escaped onto plaintiffs' land was held to raise a presumption of defendant's negligence requiring the case to be submitted to the jury. (Horwitz-Florida)
W71-11713

GANO V HALL (LIVESTOCK DAMAGE RESULTING FROM POLLUTION),
363 P2d 551-554 (Kan 1961)

Descriptors: *Kansas, *Damages, *Sheep, *Water pollution, Legal aspects, Judicial decisions, Remedies, Water pollution sources, State governments, Pollution abatement, Saline water, Oil industry, Water quality, Oily water, Water supply, Water law, Drilling, Water pollution control, Oil wastes.

Plaintiff farmer sought to recover damages resulting when his sheep became ill after drinking water from a stream which had been polluted by defendant's oil lease operations. Plaintiff contended that defendant wrongfully polluted his pasture and streams with salt water and oil, from which injury to the sheep resulted. Defendant admitted polluting the land and stream, but contended that the measure of damages should have been the difference between the fair market value of the lambs immediately before and after the alleged injury. The trial court awarded damages to plaintiff, and the Supreme Court of Kansas affirmed. The court held that anyone sustaining injury to livestock by the pollution of a stream flowing through the pasture from which the livestock drank may maintain an action and recoverany actual damages sustained. The injury to the sheep due to the drinking of the polluted water was testified to by experts. The narrow interpretation of damages sought by defendant was incorrect, and the award of damages based on lost profit was proper. (Horwitz-Florida)
W71-11722

NORMAN V GREENLAND DRILLING CO (IN-FERRED LIABILITY FOR WATER POLLUTION FROM OIL PRODUCTION OPERATIONS).
403 P2d 507-511 (Okla 1965).

Descriptors: *Oklahoma, *Water pollution sources, *Oil wastes, *Remedies, Water pollution, Water pollution effects, Pollution abatement, Path of pollutants, Oil industry, Oil, Gases, Pollutants, Percolation, Wastes, Waste disposal, Legislation, Wells, Impaired water quality, Water pollution control, Damages, Legal aspects, Judicial decisions, Groundwater.

Plaintiff landowner sued defendant oil drilling company to recover damages for the pollution of land, ponds, and a water well by gas, oil and salt water that escaped from defendant's oil well. Plaintiff contended that an Oklahoma statute, relating to the flow of oil wastes over land, precluded the necessity for proof of defendant's negligence. Plaintiff also contended that the doctrine of res ipsa loqqitur was applicable and inferred defendant's negligence. Defendant denied negligence and contended that the statute did not apply. Reversing a dismissal of plaintiff's action, the Supreme Court of Oklahoma held that the Oklahoma statute relating to damages from the flow of oil wastes over land is not applicable to pollution from underground sources. The court held, however, that defendant's negligence could be fairly inferred from the facts. Where an injury-producing pollution source is shown to be under the management of a defendant, and the accident is such as does not ordinarily happen if proper care is used, it affords a reasonable inference, in the absence of explanation, that lack of care caused the accident. (Smiljanich-Florida)
W71-11724

REISERER V MURFIN (SALINE WATER INTRUSION OF FRESH WATER WELLS FROM OIL DRILLING OPERATIONS).
331 P2d 313-316 (Kan 1958).

Descriptors: *Kansas, *Water wells, *Saline water intrusion, *Drilling, Pollution abatement, Judicial decisions, Legal aspects, Water pollution, Water pollution sources, Water pollution effects, Water pollution control, State governments, State jurisdiction, Legislation, Regulation, Oil wells, Oil wastes, Saline water, Relative rights, Water rights, Remedies.

Plaintiff landowner sought to recover damages for pollution of fresh water wells by drilling operations of defendant oil drilling company. Plaintiff owned land upon which two fresh water wells supplied water for stock and domestic consumption. Shortly after defendant started oil drilling operations and as a result of the presence of salt, salt water, and other minerals the quality of plaintiff's well water deteriorated until it was no longer suitable for its previous domestic and livestock usage. Plaintiff claimed that the pollution was the result of defendant's drilling and relied upon statutory provisions to obtain relief. Defendant appealed from the trial court's order overruling its demurrer on the grounds that plaintiff's recovery was not based on any definite legal theory, plaintiff alleged no negligence, and plaintiff alleged no casual connection between the escape of salt water and the well pollution. The Supreme Court of Kansas affirmed the trial court's order, stating that plaintiff's action was established by statute and therefore did not require allegation of negligence and that a sufficient causal connection was established to withstand the general demurrer. (Horwitz-Florida)
W71-11728

CORDER V STATE WATER POLLUTION CONTROL BD (USE OF SUBSTANTIAL EVIDENCE RULE IN DETERMINING THE VALIDITY OF ADMINISTRATIVE DECISION GRANTING PERMIT FOR SEWAGE DISCHARGE).
391 SW2d 83-90 (Civ App Tex 1965).

Descriptors: *Texas, *Permits, *Sewage effluents, *Administrative decisions, Administrative agencies, Waste water (Pollution), Waste water disposal, sewage disposal, Judicial decisions, Adjudication procedure, Legal aspects, Water districts, Treatment facilities, State governments.

Plaintiff riparian landowner sought to set aside a permit, granted by defendant water pollution control board, allowing a water control district to discharge sewage effluent into a stream adjacent to plaintiff's property. Plaintiff contended that the lower court erred in holding that a judicial review of defendant's decision was governed by the substantial evidence rule, and that defendant's decision was not supported by substantial evidence. A Texas statute rejected the substantial evidence rule and provided for a trial de novo on the review of administrative decisions. The statute, however, had previously been held unconstitutional. The Texas Court of Civil Appeals held that appeals from decisions of the Texas Water Pollution Control Board should be tried under the substantial evidence rule. Following an extensive review of the evidence, including expert testimony, the court held that defendant's decision was supported by substantial evidence. The trial court's decision in favor of defendant was affirmed. (Hart-Florida)
W71-11782

LONESTAR GAS CO V THOMAS (DAMAGE TO CATTLE FROM BICARBONATED WATER SUPPLY).
345 SW2d 844-848 (Civ App Tex 1961).

Descriptors: *Texas, *Water pollution, *Cattle, *Damages, Chemical wastes, Bicarbonates, Dairy industry, Milk, Oil industry, Natural gas, Adjudication procedure, Legal aspects, Judicial decisions.

Plaintiff dairy farmer sued defendant gas company for damages arising from injury to his cattle caused by the pollution of their water supply. Water containing sodium carbonate and sodium bicarbonate drained from defendant's cracking plant onto plaintiff's land. Plaintiff's cattle became sick after the chemicals in the water consumed by the cattle altered the acidity of their digestive systems. Defendant contended the jury's finding that the water supply had resulted in the cattle's illness was contrary to the great weight of the evidence. Defendant also asserted that the lower court erred in permitting testimony of certain witnesses without their qualification as experts. After reviewing the evidence admitted at trial, the Texas Court of Civil Appeals overruled defendant's assignments of error. The court ruled that evidence of an experiment in giving cattle water with chemicals in it was admissible in an action for damages arising from the drinking of polluted water by cattle. In addition, the court upheld the measure of damages in the jury's verdict despite the difficulty in determining the precise measure of damages. (Hart-Florida)
W71-11802

OHIO OIL CO V ELLIOT (ASSESSMENT OF DAMAGES TO LIVESTOCK PERMANENTLY AND TEMPORARILY INJURED BY SALT WATER POLLUTION FROM OIL WELLS).
254 F2d 832-836 (10th Cir 1958).

Descriptors: *Oklahoma, *Saline water intrusion, *Livestock, *Damages, Water pollution sources, Oil industry, Oil wells, Saline water-freshwater interfaces, Seepage, Stream pollution, Watercourses (Legal), Water law, Riparian rights, Water rights, Legal aspects, Judicial decisions, Remedies, Mortality, Water pollution effects, Water users, Legislation, Statutes, Water utilization, Domestic water, Pollutant identification, On-site investigations.

Plaintiff brought an action against defendant operating an oil and gas lease, for damages to his livestock from salt water pollution of a stream. An Oklahoma statute imposes liability per se for damages resulting from saline water intrusion. The United States District Court for the Western District of Oklahoma directed a verdict for plaintiff. Upon appeal, the Tenth Circuit Court of Appeals modified damages. For permanent injury the measure of damages under Oklahoma law is the difference between the reasonable market value of the livestock immediately before and after the injury, but damages could not be awarded for temporary injury to the livestock in the absence of a showing of special care or expenditures necessary to restore the livestock to their former condition of health. The award of $2000 for temporary injury was stricken from the judgment. (Rees-Florida)
W71-11824

POLLUTING WATERS--MISDEMEANOR, HEALTH AND QUARANTINE REGULATIONS.
Utah Code Ann secs 23-3-5, 26-6-2 (1969).

Descriptors: *Utah, *Environmental sanitation, *Water pollution control, *Waste disposal, Legislation, State governments, Legal aspects, Water law, Regulation, Wastes, Water pollution, Water quality control, Environmental effects, Pollution abatement, Water pollution sources, Saw mills, Reasonable use, Water utilization.

It shall be unlawful for any person or business owning or operating an industry to cause or permit any sawdust, chemical, silt, oil, tailings, or other substances injurious to fish or game to accumulate near or to seep or flow into, waters or waterways of the state reasonably necessary or desirable for the propagation of fish and game. It shall be unlawful for any person to deposit or cause to be deposited in or near any of the public waters of this state any matter that may tend to pollute any of the reservoirs or streams of this state which are or may be used for culinary purposes. Anyone violating any of these provisions is guilty of a misdemeanor. No house garbage, offal, garbage, dead animals, decaying vegetable matter or organic waste substance of any kind shall be thrown or allowed to remain upon or in any street, road, ditch, gutter, public place, private premises, vacant lot, watercourse, lake, pond, spring, or well. (Johnson-Florida)
W71-11834

POWERS OF WATER RESOURCES BOARD.
Idaho Code secs 42-1731 thru 42-1734 (Supp 1969).

Descriptors: *Idaho, *Water resources development, *Water conservation, *Administration, Legislation, Legal aspects, Planning, Water pollution, Water allocation (Policy), Water rights, Prior appropriation, Condemnation, Eminent domain, Permits, Project planning, Supply contracts, Administrative agencies.

The State Water Resources Board is to formulate and activate an integrated, coordinated multiple use water resource policy. To further this objective, administrative procedures for establishing and operating the Board are specified. Of the numerous powers and duties granted the Board, the more substantive powers are to: (1) prepare a continuing inventory of available water resources; (2) formulate a program for the conservation, development and use of all unappropriated water resources; (3) institute judicial proceedings to establish water rights by court decree on any water boyd; (4) promote water projects for the public benefit and finance their construction with revenue bonds; (5) generate and sell hydroelectric power; (6) obtain permits in the Board's name for any unappropriated waters; (7) exercise eminent domain to acquire necessary water or land rights for project construction; (8) sell water rights to political subdivisions; (9) study water pollution; and (10) recommend to the legislature necessary measures to effect a proper conservation, development and water utilization plan. (Gallagher-Florida)
W71-11835

WATER POLLUTION ACT.
Kansas Statutes Ann secs 12-3101 thru 12-3107 (1964).

Descriptors: *Kansas, *Treatment facilities, *Sewage disposal, *Cost allocation, Legislation, Legal aspects, Water pollution control, Sewage treatment, Waste treatment, Municipal wastes, Sewage, Public health, Sanitary engineering, Con-

struction costs, Assessments, Waste identification, Administration, Local governments.

No municipality shall exercise the powers granted by the Water Pollution Act until its local governing body and the state board of health have adopted a resolution finding that the municipal sewer system does not meet the board of health standards and redevelopment of the municipal sewer system is necessary for the public health. Qualified municipalities are empowered to: (1) adopt sewer service charges, (2) use the proceeds for redeveloping and operating the sewer system and paying bond obligations, (3) issue revenue bonds and borrow money, (4) exercise eminent domain to acquire rights of way for sewer systems, and (5) cooperate with and receive aid from federal and state agencies. The governing body of every municipality may adopt rules: (1) providing for the management and operation of its sewer system, (2) prohibiting discharges of certain substances into the system, and (3) providing methods and rules for collection of sewer service charges. The municipality may shut off the water supply to anyone who fails to pay sewer service charges. The Act specifies the procedure for issuance and the nature of municipal revenue bonds. (Gallagher-Florida)
W71-11841

UNITED STATES V THE CATHERINE (DISCHARGE FROM VESSELS OF OIL UPON NAVIGABLE WATERS).
212 F2d 89-93 (4th Cir 1954).

Descriptors: *Water pollution sources, *Oil, *Ships, *Accidents, Water pollution, Water quality control, Water pollution control, Pollution abatement, Pollutants, Oil wastes, Oily water, Coasts, Legislation, Federal government, Navigable waters, Admiralty, Harbors, Safety, Judicial decisions, Legal aspects.
Identifiers: *Oil Pollution Act.

Defendant ship was charged with violation of the federal Oil Pollution Act, prohibiting generally the discharge from vessels of oil upon navigable waters of the United States. The government contended that defendant had negligently allowed a few barrels of oil to escape into a harbor. Defendant denied liability, contending that the incident was caused by the presence of a rag in an oil tank valve which kept the valve from closing completely, and thus was an unavoidable accident. Affirming a trial court judgment for defendant, the United States Court of Appeals for the Fourth Circuit noted that the cause of the oil discharge was undisputed. Where escape of oil from a vessel upon navigable waters is shown, the burden rests upon the ship to bring itself within one of the exceptions in the statute. An unavoidable accident, which will relieve one from liability under the Act, is an accident which could not have been avoided by that degree of prudence and foresight which the law requires in the particular case. No one could reasonably have foreseen a casualty as in the instant case. Defendant was therefore not liable. (Smiljanich-Florida)
W71-11844

GULF OIL CORP V HUGHES (POLLUTION OF WATER WELL FROM OIL COMPANY OPERATIONS).

371 P2d 81-85 (Okla 1962).

Descriptors: *Oklahoma, *Judicial decisions, *Water pollution, *Saline water intrusion, Legal aspects, State governments, Public rights, Water rights, State jurisdiction, Pollution abatement, Water pollution effects, Wells, Water wells, Water pollution sources, Oil industry, Oil wastes, Oil-water interfaces, Oil wells, Oily water, Saline water.

Plaintiffs sought damages sustained to their land from pollution of a water well by defendant oil company's searching operations. Defendant was conducting oil operations on land adjacent to that of plaintiffs, such operation commonly known as a waterflood project. As a part of this project the defendant caused salt water to be pumped into an inject well under pressure, and as a result thereof salt water was forced through more porous rock and earth formations into the streams of water and water wells on plaintiff's property, rendering such fresh water unfit for domestic use. Plaintiffs received $6,000 damages at the trial level and the Supreme Court of Oklahoma affirmed, rejecting defendant's claim that actual negligence had to be proven for recovery. The court held that plaintiffs were entitled to damages on the theory of private nuisance and were not required to show negligence on the part of the oil company. When an oil company conducts waterflooding operations for recovery of oil the common law rule of negligence does not obtain. Constitutional provisions have intervened to protect a property owner against losses resulting from the use of nearby property. (Horwitz-Florida)
W71-11848

PENNSYLVANIA GLASS SAND CORP OF OKLA V OZMENT (DEGREE OF POLLUTION CONTEMPLATED BY A MINING LEASE).
434 P2d 893-899 (Okla 1967).

Descriptors: *Leases, *Oklahoma, *Oil wastes, *Water pollution effects, Pollution abatement, Oily water, Fuels, Water pollution, Water pollution sources, Water pollution control, Remedies, Cattle, Livestock, Industrial plants, Judicial decisions, Legal aspects, Industrial wastes, Waste disposal, Legislation, Land use, Land tenure, Mineral industry, Damages.

Plaintiff lessee sought actual and exemplary damages resulting from the discharge of oil wastes, by defendant factory operator, which drained into plaintiff's pasture and watering pond. Several of plaintiff's cattle had died after drinking water and grazing on the premises leased by plaintiff but subject to defendant's mining lease. Defendant denied either intentionally or negligently contaminating the premises. Defendant also contended that plaintiff's claim was barred by a contractual agreement and that the trial court had rejected instructions that defendant's mining lease granted it a preemptive right to the surface use of the land. The Supreme Court of Oklahoma held that dumping oil from factory machinery can not be regarded as either a natural, authorized, or incidental consequence of a mining lease to extract sand. The court noted the distinction between pollution occurring in an act contemplated by a lease and pollution utterly unrelated to the mining activity authorized by a lease. The court noted that a failure to invoke the Water Pollution Control Act at trial bars its assertion on appeal, but does not preclude other remedies. The judgment for plaintiff was affirmed. (Gallagher-Florida)
W71-11849

WATER IMPROVEMENT COMMISSION.
Maine Revised Statutes Ann tit 38, secs 361 thru 364 (Supp 1970).

Descriptors: *Maine, *Water pollution control, *Administrative agencies, *Standards, Pollution abatement, Water quality control, Water quality, Water pollution, State governments, State jurisdiction, Regulation, Permits, Water conservation, Water policy, Legal aspects, Water pollution sources, Grants, Inspection, Environment, Treatment facilities, Waste disposal, Waste water treatment.

The Water and Air Environmental Improvement Commission shall consist of ten members representing manufacturing interests, municipalities, conservation interests, and the public generally. The Commission shall hold at least two meetings per year. The Commission has the duty to prevent, control, and abate pollution of the air, waters, and coastal flats and prevent the diminution of the highest and best use of the natural environment. The Commission shall make recommendations to each legislature with respect to the control of pollution of the air, waters, coastal flats, and other aspects of the natural environment. The Commission shall make recommendations concerning the classification of waters and coastal flats, based upon reasonable standards of quality and use. The Commission shall consult and advise businesses and local governments in waste disposal matters. The Commission is also required to establish and enforce reasonable standards for the operation and maintenance of municipal treatment facilities. The Commission is designated as Maine's public agency for the purpose of accepting federal funds in relation to pollution control. Also established herein are standards of classification for fresh waters and tidal or marine waters. (Horwitz-Florida)
W71-11856

POLLUTION CONTROL, ENFORCEMENT.
Maine Revised Statutes Ann Tit 38, secs 411 thru 417, 451, 453 (Supp 1970).

Descriptors: *Maine, *Water pollution control, *Administrative agencies, *Water quality control, Administration, Standards, Permits, State governments, State jurisdiction, Legal aspects, Supervisory control (Power), Grants, Financing, Water pollution, Sewage disposal, Treatment facilities, Water pollution treatment, Wastes, Water policy, Industrial wastes, Regulation, Water pollution sources, Non-structural alternatives.

The role of the state in providing contributions, through financial grants, to local governments for pollution abatement are herein enumerated. The Water Control Commission is authorized to pay up to 30 per cent of the expense of a municipal or quasi municipal pollution abatement planning and construction program which has received federal approval and federal funds. Pollution of all surface waters by discharging any substance into such waters is prohibited unless authorized by license. Subject to certain exceptions, all persons, corporations, and municipalities are governed by this requirement. Any industrial plant or manufacturing process in operation prior to August 8, 1953, is automatically granted a license while under the same ownership. No municipal sewage treatment plant in operation in 1959 needs a license for a continuance of discharges existing at that time. Regulations are established to deal with applications for licenses. Enforcement procedures of the Commission include the establishment of mixing zones, in which discharges are allowed, and time schedules for compliance. Provisions relating to regulatory orders and violation hearings are set forth. Penalties for violations include fines of $200 to $1000 per day and liability for all damages caused by the pollution. (Horwitz-Florida)
W71-11857

ECONOMICS OF WASTEWATER COLLECTION NETWORKS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W71-11861

SOME LEGAL, SOCIAL AND ECONOMIC PROBLEMS OF GROUNDWATER POLLUTION,
Rhode Island Univ., Kingston. Water Resources Center.
For primary bibliographic entry see Field 05G.
W71-11863

LEGAL, ECONOMIC, AND TECHNICAL ASPECTS OF LIABILITY AND FINANCIAL RESPONSIBILITY AS RELATED TO OIL POLLUTION,
George Washington Univ., Washington, D.C. Program of Policy Studies in Science and Technology.
For primary bibliographic entry see Field 05G.
W71-11872

OIL DISCHARGE PREVENTION AND POLLUTION CONTROL.

Maine Revised Statutes Ann tit 38, secs 541 thru 557 (Supp 1970).

Descriptors: *Maine, *Water pollution control, *Oil wastes, *Seashores, Pollution abatement, Water pollution, Remedies, Damages, Legal aspects, State governments, State jurisdiction, Regulation, Permits, Standards, Supervisory control (Power), Administrative agencies, Water quality control, Coasts, Oil, Oil industry, Industrial wastes, Water pollution sources, Sea water.

Legislative policy is herein declared to be the preservation and protection of the seacoast as a source of public and private recreation, public use, private commercial fishing, and other commercial activities. The discharge of oil, petroleum products or their by-products into or upon any coastal waters, estuaries, tidal flats, beaches, and lands adjoining the seacoast, or into any river, stream, or other waters that drain into coastal waters, is prohibited. The Environmental Improvement Commission shall have the authority to implement this law by promulgating necessary regulations, issuing licenses, and providing the necessary administration. The operation of an oil terminal facility without a license is prohibited, and all licenses must be renewed annually. Procedures herein established to guide the Commission's actions include rule-making procedures, emergency powers, and regulatory enforcement procedures. The Maine Coastal Protection Fund is established to provide financing for the Commission, research, and third-party damages. Penalties herein provided include a fine of up to $5,000 per day, liability of the polluter for damages resulting from pollution, and reimbursement of funds expended by the Coastal Protection Fund. (Horwitz-Florida)
W71-11877

VERMONT WATER POLLUTION CONTROL, MONT PELIER.
Vermont Stat Ann Title 10, secs 901 thru 918 (1958) as amended (Supp 1971).

Descriptors: *Vermont, *Water pollution control, *Pollution abatement, *Waste disposal, Water pollution, Water quality control, Water pollution treatment, Water pollution sources, Sewage disposal, Treatment facilities, Administrative agencies, Permits, Water utilization, Recreation, Boating, Domestic water, Waste treatment, Sewage treatment, Legislation, Administration, Regulation, Payment, Induced costs, Legal aspects.

All state waters are classified into four grades of water use: (1) public water supply; (2) bathing, recreation, and agriculture; (3) recreational boating and wildlife; and (4) industrial uses. The State Water Resources Board shall classify all waters in the public interest, pursuant to prescribed guidelines and procedures. Classified waters shall be supervised by the Board, which may enforce classification orders. After a specified date, no person shall discharge any wastes into waters without first obtaining a permit for such discharge from the Department of Water Resources, which shall deny such applications if it finds that the proposed discharge would reduce the quality of the receiving waters below the appropriate classification. Procedures for the issuance of permits are detailed. A person who has been denied a waste discharge permit may apply to the Department for a temporary pollution permit. Such permits shall only be granted where the applicant demonstrates that he is constructing an approved pollution abatement facility or alternate waste disposal system. Temporary pollution permit holders shall pay pollution charges until an adequate treatment facility is established. Enforcement procedures and penalties are provided. (Smilhanich-Florida)
W71-11883

WHEY POLLUTION ABATEMENT.
Vermont Stat Ann tit. 10, secs 1261 thru 1265 (Supp 1971).

Descriptors: *Vermont, *Pollution abatement, *Administrative agencies, *Government finance, Legal aspects, Legislation, Financing, Administrative decisions, State governments, Contracts, Leases, Administration, Water pollution, Water pollution control, Water pollution treatment, Water quality, Water quality control.

The Vermont Whey Pollution Abatement Authority is created by this Vermont legislation. The law is to be liberally construed, and will prevail in the event of inconsistency with other law. Other administrative agencies are to cooperate with the Authority as requested. The Authority consists of five directors appointed by the governor with the advice and consent of the senate. Directors serve two year staggered terms. Directors may be removed for cause by the governor after public hearing; interim suspension is authorized. The Authority shall meet at least annually, and three directors constitute a quorum. Although the directors serve without compensation, they are reimbursed for their expenses. The Authority may employ and discharge at its pleasure. The Authority's powers are extensive and comprehensive, to accomplish all things necessary to effectuate the Act. Certain acts, however, may only be done with approval of the emergency board. The Authority may enter into agreements and leases with the state. A sinking fund for retirement of bonds issued by the Authority shall be created. Reserve accounts may be established. An annual report to the governor and general assembly is required. Bonds and notes issued by the Authority are not general obligations of the state; only revenue bonds may be issued. (Hart-Florida)
W71-11888

AQUACULTURE LEASE GUIDELINES.
Florida Bd of Trustees of the Internal Improvement Trust Fund (August, 1969). 3 p.

Descriptors: *Florida, *Aquiculture, *Administrative agencies, *Regulation, Legal aspects, State governments, Leases, Navigation, Warning systems, Riparian rights, Non-consumptive use, Agriculture, Facilities, Leases, Exploitation, Water law, Legislation, Administrative decisions, Water pollution, Water pollution sources, Water pollution control, Beds, Beds under water, Ecology, Environmental effects, Wildlife.

The trustees of the Internal Improvement Fund have adopted guidelines for aquaculture leases. A lease can have no detrimental effects upon existing industry, nor permanent effect upon the wildlife or ecology of leased lands. Moreover, the wildlife and ecology of the leased area must be capable of natural restoration within one year of the termination of the lease. Competitive bidding on leases is required. The Department of Natural Resources shall survey each lease to estimate the marine resources to be taken by the lessee; where substantial resources will be lost, the Trustees may require affirmative restoration by the lessee. The findings of each survey will be filed as public information with the Trustees. The area of the lease is limited to a reasonable and fair amount as determined by the Trustees. The maximum term is ten years, renewable for an additional ten years. The basic rent shall be supplemented by royalties. Accounting records shall be maintained by the lessee, audited, and submitted annually to the lessor. Leases may be cancelled if aquaculture is not pursued. Written approval of the operation from the upland owner must be secured. Leased areas must be identified with signs every 1000 feet; where the area is fenced, an entrance for public recreation must be provided. Nevertheless, a sign must be erected: 'Restricted--Aquaculture Area Leased to (Lessee) by Trustees of the Internal Improvement Fund'. (Hart-Florida)
W71-11891

FLORIDA AQUACULTURE LEASE LAW.
Florida Statutes secs 253.67 thru 253.75 (1959).

Descriptors: *Florida, *Aquiculture, *Legal aspects, *Leases, Administrative agencies, Regulation, State governments, Navigation, Warning systems, Riparian rights, Non-consumptive use, Agriculture, Facilities, Exploitation, Water law, Legislation, Administrative decisions, Water pollution, Water pollution sources, Water pollution control, Beds, Beds under water, Ecology, Environmental effects.

The Trustees of the Internal Improvement Fund are authorized to lease submerged lands and the water column for aquaculture-cultivation of animal and plant life in a water environment--to the extent consistent with the public interest. No lease may be granted, however, where the commissioners of the county involved object. The Trustees shall establish guidelines to protect the public interest and to be followed when considering applications. Applications shall contain a description of the area to be developed, a description of the proposed activities, and a sum sufficient to defray the costs of a survey. Three weeks public notice of hearings must be provided, and owners of property within 1000 feet of the development must be notified. If no objections are filed, the lease may be granted if consistent with the public interest. Any objections will be considered at public hearing. The lease term is ten years, renewable by agreement. In addition to a fixed rental fee, royalties will be paid. The maximum area must be consistent with efficient utilization and the public interest. Leases may be cancelled for failure to conduct aquaculture. The leased area must be marked, and the public must be provided with means of ingress and egress for recreation. Aquaculture without a lease constitutes a misdemeanor. Studies and recommendations of the Department of Natural Resources and the Game and Fresh Water Fish Commission shall be considered in approving any lease. (Hart-Florida)
W71-11892

APPORTIONMENT OF HARM TO CAUSES (LEGAL PRINCIPLES OF APPORTIONING DAMAGES).
American Law Institute.

Restatement (Second) of Torts, sec 433A (1965). 8 p.

Descriptors: *Damages, *Judicial decisions, *Water pollution, *Remedies, Water pollution effects, Legal aspects, Riparian waters, Riparian land, Industrial wastes, Relative rights.

Damages for harm are to be apportioned among two or more causes where there are distinct harms, or there is a reasonable basis for determining the contribution of each cause to a single harm. Damages for any other harm cannot be apportioned among two or more causes. These rules apply whenever two or more causes have combined to bring harm to the plaintiff, and each has been a substantial factor in producing the harm. They apply where each of the causes consists of the tortious conduct of a person. They apply also where one or more of the contributing causes is an innocent one. Additionally, they apply where one of the causes in question is the conduct of the plaintiff himself, whether it be negligent or innocent. There are other results which, by their nature as a distinct harm, are more capable of apportionment. There are other harms which, while not so clearly severable into parts, are still capable of division upon a reasonable basis. Such apportionment is commonly made in cases of private nuisances, where water pollution has interferred with the plaintiff's use or enjoyment of his land. Specific examples of apportionment are herein provided. (Shelnut-Florida)
W71-11894

CITY OF UTICA V WATER POLLUTION CONTROL BD (LEGISLATIVE DELEGATION OF POLLUTION CONTROL AUTHORITY).
182 NYS2d 584-589 (Ct App 1959).

Descriptors: *Legislation, *Administrative agencies, *New York, *Water pollution control, Environmental sanitation, Sewage treatment, Judicial decisions, Legal aspects, Water law regulation, State governments, Local governments, Water quality control, Municipal wastes, Sewage disposal, Pollution abatement, Water pollution sources, Treatment facilities, Adjudication procedure.
Identifiers: *Constitutionality.

Petitioner city was the defendant in an action brought under the New York Water Pollution Control Law by the New York Water Pollution Control Board for Petitioner's illegal discharge of untreated sewage. Petitioner sought a writ of prohibition restraining further hearings on these alleged violations. Petitioner contended that the New York Water Pollution Control Law was unconstitutional as an invalid delegation of legislative authority which failed to give adequate standards to guide the Board. The lower court dismissed the petition for the writ. The New York Court of Appeals affirmed and held that legislation designed to abate and prevent water pollution is within the state police powers as a matter of state concern and may be properly delegated to an administrative body. The court recognized that water pollution control is a difficult task because of variances in the different waters within a state. The court ruled that the legislature had properly delegated broad powers to the Board to deal with the problem but had also provided sufficient guidelines so as to make the delegation of legislative authority constitutional. (Johnson-Florida)
W71-11902

STATE V OLE OLSEN, LTD (DEVELOPER'S INSTALLATION OF INADEQUATE SEWAGE DISPOSAL SYSTEM).

317 NYS2d 538-542 (S Ct 1971).

Descriptors: *New York, *Domestic wastes, *Septic tanks, *Pollution abatement, Sewage effluents, Judicial decisions, Legal aspects, Water law, State governments, Water pollution, Water pollution sources, Water pollution control, Water quality control, Pollution abatement, Administrative agencies, Regulation, Sewage, Sanitary engineering, Sewage disposal, Sewage treatment, Environmental sanitation, Adjudication procedure, Recreation facilities.

Plaintiff Attorney General sued to abate a public nuisance allegedly caused by defendant developers. For purposes of defendants' motion to dismiss, the Court accepted plaintiff's allegations as true. Plaintiff alleged that: (1) defendants developed an area of 42 vacation and recreation homes adjacent to a lake; (2) defendants knowingly installed completely inadequate sewage disposal systems in the homes; (3) the inadequacy was caused by the inability of the soil to absorb the untreated effluent released by the septic tanks, causing an overflow of effluent into the lake; and (4) the lake and adjacent areas were irreparably damaged and contaminated by the effluent. The Supreme Court of New York, Westchester County, ruled that the alleged facts constituted a cause of action setting forth the creation and maintenance of a public nuisance by defendants. The Court also allowed joinder of the owners of the defective septic tanks as defendants. However, these parties were held not necessary to the action because the creators of the nuisance could not release themselves from liability by conveying the property to another. (Johnson-Florida)
W71-11904

UNITED STATES V LEBEOUF BROS BARGE CO (UNAVOIDABLE ACCIDENT AS A DEFENSE TO OIL SPILLS).
368 F2d 221-223 (5th Cir 1966).

Descriptors: *United States, *Water pollution control, *Oily water, *Ships, Water pollution sources, Leakage, Judical decisions, Federal government, Legal aspects, Water law, Legislation, Federal jurisdiction, Oil, Oil industry, Water pollution, Pollutant identification, Pollutants, Water quality control, Adjudication procedure, Remedies.
Identifiers: *Oil Pollution Act.

Plaintiff United States sought to impose penalties, under the Oil Pollution Act, against defendant barge owner for the negligent discharge of oil into navigable waters. The barge had been known to leak since it was about one year old. The barge was loaded with crude oil and was passing through a lock when bubbles of oil were noticed coming from the side of the barge. The barge left an oil slick in the lock which eventually dissipated into the water. Testing of the barge failed to disclose any leaks, but several days later a leak in the barge was discovered. The trial court ruled that the discharge resulted from an unavoidable accident and thus did not violate the Act. The Fifth Circuit Court of Appeals reversed and held that under the Oil Pollution Act the defense of unavoidable accident is not available to a party charged with the negligent discharge of oil where there is no proof of any inspection of a vessel after loading and the operator had reason to expect that leakage would occur. The court ruled that the discharge of any amount of oil that could have been avoided is prohibited. (Johnson-Florida)
W71-11912

DOUGLAS AIRCRAFT CO V KERNS (PERMANENT DAMAGES FROM STREAM POLLUTION),

164 F2d 1007-1011 (10th Cir 1947)

Descriptors: *Industrial wastes, *United States, *Damages, *Water pollution effects, Sewage disposal, Pollutants, Water pollution, Impaired water quality, Remedies, Effluents, Treatment facilities, Judicial decisions, Legal aspects, Real property, Adjudication procedure, Pollution abatement.

Plaintiff riparian owners instituted this action against defendant manufacturer to recover damages for the pollution of a stream which traversed plaintiffs' land. In operating a sewage disposal system, defendant permitted industrial effluents to flow into the stream. Plaintiffs contended that their lands had suffered permanent damages, but conceded that there was no visible physical damage to their lands. Plaintiffs also contended that the psychological effect of the temporary nuisance resulting from defendant's activities would linger on and permanently affect the land's value. Defendant contended that the effluent discharge had ceased and that one good rain would restore the stream to its former state. The United States Circuit Court of Appeals for the Tenth Circuit held that in an action for stream pollution evidence of permanent injury to realty is insufficient when evidence discloses that the dumpage of sewage has ceased and that one good rain would restore the stream to its former state. The court reversed the trial court's award of permanent damages because plaintiffs had failed to show any lasting change in their realty. Plaintiffs' award of damages for the temporary nuisance was affirmed. (Shelnut-Florida)
W71-11922

UNITED STATES V BALLARD OIL CO OF HARTFORD (DISCHARGE OF OIL INTO NAVIGABLE WATER).
195 F2d 369-371 (2d Cir 1952).

Descriptors: *Oil, *Water pollution sources, *Navigation, *Waste disposal, Water pollution, Water quality control, Water pollution control, Water pollution effects, Pollutants, Oily water, Ships, Rivers, Wastes, Accidents, Storage tanks, Pipes, Federal government, Legislation, Banks, Wastes, Judicial decisions, Legal aspects.

Defendant oil company was charged with violation of a federal statute prohibiting both the discharge of refuse matter into any navigable water and the depositing of waste material on the bank of any navigable water whereby navigation may be impeded. The government contended that defendant, while pumping oil into a tank, caused oil to overflow the tank and find its way through a waste pipe into a river. Defendant contended that the facts showed only a violation of the section of the statute prohibiting the discharge of refuse matter into navigable waters. As the trial judge stated that defendant had impaired navigation, which only applied to the second offense prohibiting waste deposits on banks, it was contended that the trial judge had committed reversible error. In affirming the trial court's conviction of defendant, the United States Court of Appeals for the Second Circuit noted that a violation of the first offense needs no showing of navigation impairment. Although the trial judge had stated that defendant had impaired navigation, the evidence was sufficient only to establish commission of the first offense. As the evidence was substantial, no reversible error was committed. (Smiljanich-Florida)
W71-11923

UNITED STATES V THE VESSEL JUPITER (ADMIRALTY ACTION FOR VIOLATION OF OIL POLLUTION ACT).
151 F Supp 489-490 (S D Fla 1957).

Descriptors: *United States, *Admiralty, *Oil wastes, *Ships, Water pollution, Water pollution sources, Water law, Law of the Sea, Legal aspects, Judicial decisions, Federal government, Legislation, Oily water, Fuels, Risks, Remedies, Navigable waters, Coasts, Waste disposal, Discharge (Water), Damages, Federal jurisdiction.
Identifiers: *Oil Pollution Act.

The United States brought suit in admiralty, under action of libel in rem, against defendant steamship for the alleged discharge of oil into navigable coastal waters. Under the Oil Pollution Act, such discharges are prohibited and punishable by a fine of not less than $500 nor more than $2500. Defendant contended that a criminal conviction for violation of the Act was a condition precedent to the bringing of the libel action against the vessel. Defendant also contended that the vessel's liability is measured by, and confined to, the penalty imposed through such criminal proceeding. The United States District Court, Southern District of Florida, recognizing the contention to be of first impression, overruled defendant's exceptions. The Court observed that the Oil Pollution Act was similar to the New York Harbor Act of June 29, 1888, in that both impose a direct liability upon a vessel for the fine prescribed, and both acts declare that a summary action in libel is permissible without first awaiting the possibly slow course of criminal proceedings. (Rees-Florida)
W71-11925

POWELL BRISCOE, INC V PETERS (INJUNCTIVE RELIEF AGAINST OIL AND GAS LESSEE).

269 P2d 787-791 (Okla 1954).

Descriptors: *Oklahoma, *Saline water intrusion, *Remedies, *Oil fields, Water pollution, Oil wells, Saline water, Oil wastes, Leases, Seepage, Permeability, Fresh water, Ponds, Waste disposal, Water pollution effects, Judicial decisions, Legal aspects, Oil industry, Pollution abatement, Adjudication procedure, Salinity, Vegetation.
Identifiers: Injunction (Prohibitory).

Plaintiffs sought a permanent injunction restraining defendant oil and gas lessees upon plaintiffs' land from using an earthen pit for impounding salt water produced in the operation of several oil wells. Plaintiffs alleged the brine would seep from the tank into the soil destroying vegetation and polluting fresh water and would, thereby, constitute a private nuisance. The injunction was awarded upon findings that additional wells would probably be

drilled and that the output of one well already producing salt water would probably increase. The Supreme Court of Oklahoma reversed and held that: (1) where an oil lease is operated in an ordinary way with customary precautions, incidental annoyances offer no grounds for an injunction; (2) an injunction will not issue to protect a right not in esse and which may never arise or to restrain acts that do not constitute a cause of action; (3) when injury can be fully compensated in money damages and defendants are wholly solvent, a permanent injunction should not be granted. The judgment for plaintiffs was reversed on grounds that the trial court's findings were speculative and not sustained by the evidence. (Rees-Florida)
W71-11930

FARMERS IRRIGATION CO V GAME AND FISH COMM (FISH HATCHERY'S LIABILITY FOR WATER POLLUTION).

369 P2d 557-560 (Colo 1962).

Descriptors: *Colorado, *Water pollution sources, *Appropriation, *Preferences (Water rights), Eminent domain, Water utilization, Water rights, Water pollution, Wildlife, Fish, State governments, Administrative agencies, Remedies, Judicial decisions, Legal aspects, Legislation, Beneficial use, Relative rights, Irrigation, Fish hatcheries.
Identifiers: Constitutionality.

Plaintiff irrigation company brought this action against defendant Game and Fish Commission seeking just compensation for property taken or damaged by defendant. Defendant constructed a fish hatchery upstream from plaintiff and diverted water into the hatchery. Large quantities of protein matter were placed into the water as fish feed. The water was then returned to the channel without the impurities being removed. Plaintiff contended that the diverted was so polluted as to render it unfit for irrigation purposes and that its property rights were destroyed or seriously damaged. Defendant asserted sovereign immunity as a state agency. The Supreme Court of Colorado held a priority to the use of water for irrigation is a property right that is constitutionally protected, and an owner of a water right is protected from having it taken or damaged for public or private use without just compensation. The court ruled that plaintiff had stated a good cause of action. The lower court's dismissal of the action was, therefore, reversed and remanded for further proceedings. (Shelnut-Florida)
W71-11934

SUN OIL CO V HOKE (OIL LESSEE'S DUTY TO PREVENT POLLUTION).

169 P2d 753-759 (Okla 1946).

Descriptors: *Oklahoma, *Water pollution effects, *Livestock, *Damages, Water pollution, Saline water, Water pollution sources, Oil wells, Oil wastes, Saline water intrusion, Ponds, Fresh water, Toxicity, Poisons, Mortality, Settling basins, Leakage, Seepage, Waste disposal, Leases, Judicial decisions, Legal aspects, Oil fields, Oil industry, Land tenure.

Plaintiff agricultural tenant sought to recover damages from defendant oil company for the death and injury of his livestock after they drank salt water that had escaped from defendant's oil well. Plaintiff contended defendant had negligently allowed oil and salt water to escape and flow over the land into plaintiff's pond. Defendant denied negligence and contended that plaintiff had failed to state a cause of action and had also failed to prove damages. The Supreme Court of Oklahoma affirmed judgment for plaintiff and held that an oil and gas lessee owes a duty to the holder of a grazing lease on the same land not to permit the escape of deleterious substances so as to poison and pollute water to which livestock has access. The court ruled that evidence that plaintiff lost both livestock and sheep and that his remaining livestock depreciated in value together with competent testimony that the cause of such losses was defendant's breach of duty was sufficient proof of damage. The court determined the proper measure of damages for injuries to livestock from drinking polluted water to be the difference between the reasonable market value immediately prior to and subsequent to the injury. (Rees-Florida)
W71-11936

CLEARY PETROLEUM, INC V COPENHAUER (LIABILITY FOR POLLUTING LIVESTOCK WATER).
476 P2d 327-329 (Okla 1970).

Descriptors: *Water pollution effects, *Damages, *Cattle, Judicial decisions, Water pollution, Legal aspects, State governments, Remedies, Oil fields, Oil wastes, Oil wells, Oily water, Saline water, Water pollution sources, Saline water-fresh water interfaces, Impaired water quality, Oil industry, Leases, Secondary recovery (Oil).

Plaintiff cattle rancher brought an action against defendant oil company for injuries sustained when his cattle drank polluted water. Defendant oil company had allowed salt water and oil to pollute a creek from which plaintiff's cattle drank. Plaintiff contended that the water contained such quantities of pollutants as to render it unsuitable for livestock use and that the defendant's secondary recovery operations were the direct cause of injury to his cattle. Defendant claimed that there was insufficient evidence to prove that the water was polluted and, furthermore, contended that the damages allowed by the trial court were excessive. The Supreme Court of Oklahoma held that pollution emanating from a plugged and abandoned well, located in a waterflood lease, which enters a stream crossing a pasture constitutes negligence per se under an Oklahoma statute. The court affirmed the lower court's judgment because testimony that plaintiff's cattle were in fact proximately injured by the ingestion of salt water sufficed to submit the question of liability to the jury. Noting that the measure of damages could include losses resulting from calf abortions, the court affirmed the award of damages. (Horwitz-Florida)
W71-11937

FELL AND WOLFE OIL CO V STATE (CONDITIONS PRECEDENT TO CONVICTION FOR POLLUTION).
480 P2d 277-279 (Crim App Okla 1971).

Descriptors: *Oklahoma, *Pollution abatement, *Remedies, *Saline water, Judicial decisions, Legal aspects, State governments, Legislation, Water pollution, Oil, Oil fields, Oil wastes, Oil industry, Water pollution sources, Water pollution effects, Public rights, Wells, Navigable waters, Salinity, State jurisdiction, Administrative decisions.
Identifiers: Arkansas River.

Defendant oil compnay was convicted for the discharge of salt water into a tributary of the Arkansas River under an Oklahoma statute which makes such discharges a crime punishable by a fine of not less than $100 nor more than $500 per day. The Court of Criminal Appeals of Oklahoma reversed and held that before a defendant can be convicted for 'pollution', as a result of discharging salt water into a tributary of the Arkansas River, it is necessary to prove that such a violation of Oklahoma statutes has been reported to the Oklahoma Corporation Commission and that defendant failed to take corrective action. Defendant's conviction was reversed and remanded with instructions to dismiss. (Horwitz-Florida)
W71-11939

CITY OF HENRYETTA V RUNYAN (MEASURE OF DAMAGES FOR TEMPORARY POLLUTION).

370 P2d 565-567 (Okla 1962).

Descriptors: *Oklahoma, *Damages, *Water pollution sources, *Waste water (Pollution), Waste water disposal, Diversion, Judicial decisions, Legal aspects, Groundwater, Water pollution, Water supply, Water quality, Pollution abatement, Local governments, State governments, Relative rights, Remedies, Dams, Water pollution effects.

Plaintiff downstream landowners sought to recover damages for the diversion and pollution of water by defendant municipality. In 1949 defendant constructed an outflow and began to divert water to supply its residents with water. Below the outfall defendant maintained a plant which periodically discharged sediment into the creek. Such discharges polluted the creek, which ran through plaintiffs' pasture, and forced plaintiffs to water their cattle elsewhere. Plaintiffs brought action in 1956. Plaintiffs claimed that defendant's diversion was wrongful and that the periodic discharge of sediment made the water unsafe for consumption by cattle. The Supreme Court of Oklahoma held that the measure of damages for the temporary pollution of a stream through a pasture is the difference in rental value before and after the pollution. The court ruled that plaintiffs' cause of action for the defendant's diversion was barred by a two-year statute of limitations. The court held that plaintiffs had failed establish any depreciation in the rental value of their pasture and were, therefore, entitled only to that portion of the trial court's money award that represented the injury sustained when four cattle became mired and drowned in the mud from defendant's discharge. (Horwitz-Florida)
W71-11959

CORWINE V MARACAIBO OIL EXPLORATION CO (POLLUTION OF STOCK POND BY ADJOINING OIL LESSEE).
334 P2d 419-424 (Kan 1959).

Descriptors: *Kansas, *Oil wastes, *Water pollution effects, *Cattle, Stock water, Judicial decisions, Legal aspects, Water pollution, Water quality, Damages, Livestock, Farm ponds, Surface drainage, Runoff, Oil, Oil fields, Oil industry, Leases, Drainage effects, Oily water, Oil wells, Remedies.

Plaintiff landowner sought actual and punitive damages from defendant corporation for the pollution of plaintiff's stock pond by oil, salt water, and refuse escaping from defendant's adjoining oil lease operations. Plaintiff rented a farm on which he raised cattle. Defendant operated an oil and gas lease on the same farm. Defendant's operations were separated from those of the plaintiff by an embankment which had a drainage pipe through it. Refuse had accumulated in and drained through this pipe into plaintiff's stock pond. Defendant maintained that the evidence was insufficient to support punitive damages and was inconsistent with the verdict. The Supreme Court of Kansas held that an intent to injure is not required for an award of punitive damages for the pollution of a stock pond through the operation of an adjoining oil lease. The court also held that actual damages for the pollution of a stock pond encompasses the loss of weight of cattle, the loss of cattle, medical expenses, and other items proximately caused by the pollution. The judgment for plaintiff was affirmed on grounds that the award of punitive damages was proper and the evidence was not inconsistent with the verdict. (Robinson-Florida)
W71-11966

CITIES SERVICE OIL CO V BILLEN (PERMISSIVE POLLUTION OF UNDERGROUND WATERS).
347 P2d 637-640 (Okla 1959).

Descriptors: *Saline water-fresh water interfaces, *Oil fields, *Oklahoma, *Water pollution sources, Oil wastes, Water supply, Water pollution, Oil industry, Subsurface drainage, Geologic formations, Oily water, Groundwater, Legal aspects, Judicial decisions, Water wells, Saline water intrusion, Salinity, Damages, Adjudication procedure.

Plaintiff landowners brought an action against defendant oil company and others to recover actual and punitive damages for the salt water pollution of fresh water formations underlying plaintiffs' land. Defendants had stored salt water in a pond which extended over the water formation which ran under plaintiffs' land. Plaintiffs contended that defendants' actions constituted a nuisance. Defendants contended any pollution of plaintiffs' fresh water supply was permissive due to a release by which the plaintiffs' grantor had given defendants a salt water easement. After a verdict for plaintiffs, defendants appealed the trial judge's instructions to the jury relating to the issue of permissive pollution and the purported release. The Supreme Court of Oklahoma held that in an action against an oil company for salt water pollution of fresh water formations underlying a plaintiff's land, fair instructions may be given as to permissive pollution where the evidence justifies such instructions. The judgment for plaintiffs was affirmed on grounds the evidence reasonably tended to prove the facts of the case. (Gallagher-Florida)
W71-11969

GEOCHEMICAL SURVEYS V DIETZ (DAMAGES FOR WELL POLLUTION THROUGH NEGLIGENT DISPOSAL OF SALT WATER).
340 SW2d 114-121 (Civ App Tex 1960).

Descriptors: *Water pollution sources, *Texas, *Saline water intrusion, *Water wells, Farms, Saline water, Settling basins, Water pollution effects, Seepage, Percolation, Oil wells, Oil wastes, Exploration, Soil water movement, Subsurface flow, Hydrology, Limestones, Porosity, Damages, Judicial decisions, Legal aspects, Water pollution, Oil industry, Oil fields.

Plaintiff owners of farmland sought permanent damages from defendant partnership for the pollution of a water well by saline water that percolated through porous limestone. Plaintiffs contended defendant had been negligent in disposing of saline water in settling basins while exploring under oil and gas leases. Defendant's drilling operations began in 1956; plaintiffs first discovered the pollution in 1958. Upon appeal, defendant contended that a two-year statute of limitations barred plaintiffs' recovery and that its conduct was not the proximate cause of the pollution. The Court of Civil Appeals of Texas held that: (1) defendant's disposal of saline water into open pits was lawful and did not constitute an invasion of plaintiffs' property; (2) plaintiffs were injured by the subsequent pollution of their well at which time a cause of action arose; and (3) defendant's plea of limitation was not well founded because the actual pollution of the well occurred within the statute of limitations. The court ruled that the testimony of an expert hydrologist, as to the causal relationship between the disposal methods of defendant and the pollution of plaintiffs' well, established defendant's negligence as the proximate cause of plaintiffs' injury. The judgment for plaintiff was affirmed. (Rees-Florida)
W71-11970

SUNRAY MID-CONTINENT OIL CO V TISDALE (WATER POLLUTION FROM THE NEGLIGENT PLUGGING OF AN OIL WELL).
366 P2d 614-616 (Okla 1961).

Descriptors: *Oklahoma, *Oil wells, *Water pollution effects, *Saline water, Exploration, Oil wastes, Water wells, Saline water intrusion, Water supply, Water sources, Water utilization, Soil contamination, Subsurface investigations, Soil types, Sands, Damages, Judicial decisions, Legal aspects, Oil industry, Secondary recovery (Oil).

Plaintiff brought an action against defendant oil company for the pollution of the fresh water stratum underlying his land. Defendant had drilled an exploratory well near a water well on plaintiff's property. Ten months later the well water became salty and unfit for domestic use. Soil investigations revealed that if the oil well had been properly plugged, salt water would not have escaped. The defendant appealed a judgement for the plaintiff to the Supreme Court of Oklahoma. The court held that the question of whether an oil-well operator was negligent in plugging an exploratory well and whether such negligence is the proximate cause of salt water pollution is a jury question. The court also ruled that hypothetical questions based on facts which a jury would be justified in finding to be established by the evidence are not improper, even though not stated in the exact terms shown by the evidence. Judgement for the plaintiff was affirmed on grounds that there was sufficient evidence to sustain the verdict and judgment on appeal. (Rees-Florida)
W71-11971

DRAKE V SMITH (POLLUTION OF COMMUNITY WATER SUPPLY).
337 P2d 1059-1062 (Wash 1959).

Descriptors: *Washington, *Water supply, *Water pollution sources, *Saw mills, Remedies, Industrial wastes, Legal aspects, Water rights, Judicial decisions, Damages, State governments, State jurisdiction, Pollution abatement, Water quality, Water pollution control, Public rights, Relative rights, Land tenure, Water law, Sawdust, Water works.

Plaintiff landowners sought to recover damages for pollution of a stream utilized by their community water system by defendant logging and saw mill operator. Plaintiffs had maintained and operated the water system since 1908. Defendant established a saw mill upstream from plaintiff's system in 1954. Plaintiffs contended defendant's operations rendered their water supply unsuitable for domestic use. The trial court found permanent pollution and awarded plaintiffs judgment. On appeal, defendant contended that there was insufficient evidence to support a finding of permanent pollution, the doctrine of appropriation applied only to public lands, plaintiffs had acquired no water rights because they were not mentioned in prior deeds. The Supreme Court of Washington affirmed and held that there was substantial evidence to prove permanent damages since defendant had no intention of correcting the situation. The court ruled a water right was an interest in real property appurtenant to the land and passes to the grantee when the land is conveyed. The court ruled plaintiffs were entitled to permanent damages plus the reasonable cost of securing a substitute water supply prior to the time of trial. (Horwitz-Florida)
W71-11973

WARDROP V CITY OF MANHATTAN BEACH (LIABILITY FOR STORING CONTAMINATED WATER).
326 P2d 15-26 (Dist Ct App Cal 1958).

Descriptors: *California, *Adjudication procedure, *Human diseases, *Water pollution effects, Judicial decisions, Sumps, Legal aspects, Water law, Pumping, Waste disposal, Drainage, Cesspools, Public health, Diseases, Viruses, Water pollution, Damages, Flooding, Epidemics.

Plaintiff minor and parents sued defendant city and landlords in trespass for personal injuries sustained as a result of contracting poliomyelitis from fecally contaminated waters. Defendants pumped contaminated water, over objections of plaintiffs, from a sump, that was not draining, into plaintiffs' backyard where it stayed for several days. The minor plaintiff fell into this contaminated water. Two doctors testified that the disease is found in such waters. Defendants contended that plaintiffs had established no causal connection between their actions and the disease. The jury returned a verdict for plaintiffs, but the trial judge granted a motion for a judgment notwithstanding the verdict. The California District Court of Appeal held that in an action for damages sustained from contracting polio from infected waters, all that a plaintiff must do is present a question for the jury as to whether the source of the infection was the polluted water. The court reversed and directed the trial court to enter judgment for the plaintiffs because the case had been properly submitted to the jury. (Robinson-Florida)
W71-11976

SWANGO V COUNTRY SQUIRE MOTEL, INC (INJURY TO CATTLE FROM POLLUTED WATER).
431 P2d 839-840 (Ore 1967).

Descriptors: *Oregon, *Treatment facilities, *Stock water, *Water pollution effects, Riparian land, Riparian waters, Riparian rights, Sewage disposal, Water consumption, Damages, Remedies, Water pollution, Water pollution sources, Water pollution effects, Judicial decisions, Legal aspects.

Plaintiff lower riparian landowner brought suit against defendant service station and motel operators seeking to enjoin alleged water pollution and to obtain damages incurred when plaintiff's cattle became ill after drinking the polluted water. One of the defendants had constructed a sewage disposal plant to treat the water from their operations. In the summer the discharge from the plant went first into a holding tank and then into a small stream. In the winter the discharge went directly into the stream. Plaintiff contended that his cattle became ill and lost weight from drinking the stream water. The testimony of expert witnesses conflicted as to the effect of the water on the cattle. The Supreme Court of Oregon affirmed the lower court's judgment for defendants; the court held that the evidence was insufficient to show that the actions of defendants caused the illness in plaintiff's cattle. The court based its decision on the grounds that a majority of witnesses had testified that the water was not unsafe for cattle. (Shelnut-Florida)
W71-11988

A BILL TO AMEND THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 TO REQUIRE THE SECRETARY OF THE ARMY TO TERMINATE CERTAIN LICENSES AND PERMITS RELATING TO THE DISPOSITION OF WASTE MATERIALS IN THE WATERS OF THE NEW YORK BIGHT, AND FOR OTHER PURPOSES.
House Bill 991, 92d Cong, 1st Sess (1971). 2p.

Descriptors: *Permits, *Water pollution control, *Administrative agencies, *Bays, Legislation, Water pollution, Pollution abatement, Pollutants, Water quality, Water quality control, Legal aspects, Federal government.

The National Environmental Policy Act of 1969 would be amended by this proposed legislation to require the Secretary of the Army to terminate all permits for discharge of any sewage, sludge, spoil, or other waste into New York Bight, or other waters within 25 miles of Ambrose Lighthouse. Furthermore, the Secretary, through the Chief of Engineers, shall investigate the methods and cost of restoring these waters to their original condition and report his finding to Congress within one year. (Hart-Florida)
W71-12037

UNITED STATES V STEEL TANK BARGE RAINIER.
235 Fed Supp 361-362 (WD La 1964).

Descriptors: *Oil, *Leakage, *Ships, *Pollution abatement, Accidents, Seaworthiness, Regulation, Inspection, Inland waterways, Transportation, Legal aspects, Oil wastes, Oil industry, Water pollution control, Water pollution, Water pollution sources, Legislation, Judicial decisions.
Identifiers: *Oil Pollution Act of 1924.

Plaintiff United States brought a proceeding in rem against defendant barge for penalties for discharge of oil in violation of the Oil Pollution Act of 1924.

According to the findings of fact, the barges involved were new, having received their first renewal certificate a month before the oil spill occurred. Neither of the barges were leaking when loading began nor when loading was completed, and if there was any defect in either of them, or if either of them was unseaworthy, it was not discoverable by due diligence. Prior to and during the loading, the tanks of the barges were gaseous and could not be entered for internal inspection. At the drydock, it was found that one barge had struck a submerged wooden object. The striking of the submerged object was an accident which could not have been avoided by reasonable care, prudence, and caution. Bayou Boeuf is an inland waterway of the United States in which the tide ebbs and flows. The United States district court concluded that the bayou was a coastal navigable waterway of the United States, and that the oil discharged was spilled through an unavoidable accident. Judgement was rendered for defendant. (Gallagher-Florida)
W71-12066

TELLIS V MUNICIPAL COURT, CENT JUD DIST, CITY OF MARIN (REGULATING SEWAGE DISPOSAL FROM BOATS THROUGH COUNTY ORDINANCE).

85 Cal Rptr 459-461 (Dist Ct App 1970).

Descriptors: *California, *Boating regulations, *Sewage disposal, *Water pollution control, Water pollution sources, Judicial decisions, Legal aspects, Water law, State governments, Local governments, Boats, Permits, Public health, Inspection, Legislation, Safety, Water quality control.

Plaintiffs were charged in a municipal court with the violation of a county ordinance requiring an occupancy permit for the residential use of a moored vessel. The ordinance required sanitary methods of sewage disposal from such vessels and barred the discharge of residential sewage along the coastline. Plaintiffs sought a writ of prohibition to bar further proceedings on grounds that the ordinance required them to waive their fourth amendment rights. The Superior Court denied plaintiffs relief, and the California Court of Appeal, First District, affirmed this decision. The court ruled that the ordinance was a valid exercise of the policy power of the county, designed to insure public safety, and was not proscribed by any federal jurisdiction over admiralty and maritime matters. (Johnson-Florida)
W71-12075

PEOPLE V NEW PENN MINES, INC (ABATEMENT OF NUISANCE CAUSED BY THE DRAINAGE OF MINE WASTES).
28 Cal Rptr 337-343 (Dist Ct App 1963).

Descriptors: *Pollution abatement, *Mine drainage, *California, *Mine wastes, Water pollution control, Fishkill, Legal aspects, Judicial decisions, Water law, Legislation, State governments, Jurisdiction, Mining, Waste dumps, Settling basins, Water pollution sources, Water pollution effects, Mineral water, Waste disposal, Water quality control, Administrative agencies, Mineral industry, Adjudication procedure.

Defendant owned a copper and zinc mine which for many years had been relatively inactive. During its years of active operations, however, fluid mine wastes were drained into settling ponds and ore tailings were piled in dump areas. Both the ore tailings and the accumulated pond wastes contained soluble mineral salts. During the rainy season, surface water flowed over the dumps and pond wastes and picked up concentrations of minerals which drained into a river. These mineral concentrations harmed fish life and resulted in fish kills. The Attorney General sought abatement of the public nuisance caused by this drainage. The lower court dismissed the action for lack of subject-matter jurisdiction. The California District Court of Appeal, Third District, held that the Attorney General's common law power to maintain a nuisance abatement action is precluded by the Dickey Water Pollution Act which delegates exclusive state agency jurisdiction to regional water pollution control boards on matters of this nature. The court ruled that the drainage of accumulated mine wastes into streams or other water bodies falls within the administrative sphere. The lower court's dismissal of the action was affirmed. (Johnson-Florida)
W71-12079

UTILIZATION OF WATER DEVELOPMENT FUNDS.
Hawaii Rev Statutes sec 183-32 (1968).

Descriptors: *Hawaii, *Watersheds (Basins), *Land tenure, *Water pollution control, Legislation, Easements, Eminent domain, Legal aspects, Water pollution, Water quality, Water quality control, State governments, Forest management, Water conservation, Watershed management, Water resources, Water resources development, Multiple-purpose projects, Groundwater basins, Water sources, Real property, Non-structural alternatives.

Funds appropriated for water development shall be used by the Department of Land and Natural Resources only for the acquisition by purchase or exchange of any land or interest in land determined to be a watershed and the acquisition by condemnation of forest reserve easements. Certain exceptions are set forth. Forest reserve easements constitute the right to possession and control of land for the purpose of protecting and promoting forest growth and protecting surface and underground waters from pollution. Such easements encompass the right to exclude the owner in fee from the land. Forest reserve easements do not deprive the owner or lessee of any water right or the right to enter the land for the full use and enjoyment of any water right or any other rights in the land as long as reasonable measures are taken to prevent water pollution. (Robinson-Florida)
W71-12095

RHONE-MEDITERRANEAN-CORSICA BASIN AGENCY (AGENCE DE BASSIN RHONE-MEDITERRANEE-CORSE),
Agence de Bassin Rhone-Mediterranee-Corse, Paris (France).
For primary bibliographic entry see Field 05G.
W71-12101

EASTLAND COURT HEARS WHITAKER CASE.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.

Cross Section, V. 16, N. 1, January 1970, p. 1-2.

Descriptors: *Groundwater, *Water law, *Legal aspects, *Water utilization, *Values, Groundwater mining, Flooding, Leases, Fresh water, Irrigated land, Texas, Water conservation, Water rights.
Identifiers: Texas High Plains.

The Eastland Court of Civil Appeals (11th Court of Civil Appeals, Texas) enjoined Sun Oil Company from pumping groundwater to be used in water flooding from Whitaker's land. The issue concerns proper interpretation of a standard oil and gas lease executed in 1946. Sun Oil contends that the use of a wood-coal and water-clause in the lease, established before Whitaker owned the land, includes use of groundwater for water flooding. Whitaker maintains that since water flooding was not practical in the area before 1948, or in nearby areas until 1963, Sun has no right to fresh water for water flooding. Sun stipulated that flooding would use 35 percent of Whitaker's fresh water. The value of agricultural land in the Texas High Plains is proportional to available groundwater. A decision favorable to Sun would cloud the title of groundwater rights throughout Texas. (Popkin-Arizona)
W71-12102

DISTRICT PRESENTS STATEMENT BEFORE THE TEXAS WATER RESOURCES STUDY COMMITTEE.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.

Cross Section, Vol 16, No 7, July 1970, p 3.

Descriptors: *Water law, *Political aspects, *Water requirements, *Research and development, *Financing, Water quality, Costs, Texas, Properties, Riparian rights, Artificial recharge, Ecology, Environment, Water management (Applied), Water resources development, Bonding, Public benefits, Irrigation on water, Economics, Pollution abatement, Oil industry, Project benefits.
Identifiers: *Codification, *High Plains Underground Water Conservation District No 1, *Texas Water Resource Study Committee, *Texas Water Plan.

A statement prepared by the High Plains Underground Water Conservation District No. 1 and submitted before the Texas Water Resource Study Committee on June 19, 1970, is presented. The committee established by House Concurrent Resolution 12 of the 61st Legislature, is holding public hearings regarding several water issues, particularly financing and scope of the Texas Water Plan. The statement discusses area water requirements, State Water Law, water-resources research, financing, water-quality problems, and project-costs. Groundwater in Texas is the private property of the landowner. Texas groundwater laws should be recodified without substantive changes. Research in artificial recharge, ecology, environment, and water management should be supported and reviewed by the State. Interim financing of water-resource development projects is necessary. Water users should pay for part of public funded projects designed for their benefit and the total population should be willing to share irrigation water costs as agriculture is the dominant economy. Methods are suggested to protect groundwater quality through oil well design, monitoring, and abandonment.
W71-12118

MAN'S PERPETUAL QUEST FOR WATER,
Geological Survey, Washington, D.C. Water Resources Div.
Raymond L. Nace.
UNESCO Courier, June 1970, p 4-11. 8 fig.

Descriptors: *International Hydrologic Decade, *Water resources development, *Natural resources, *Water utilization, Water demand, Water quality, Water pollution, Irrigation, Flood plains, Arid lands, Humid areas, Hydrologic data, Flood control, Irrigation programs, Drainage programs, Desalination, Water reuse, Meteorology.
Identifiers: *Historical hydrology, *Scientific hydrology, *Water crisis, Chad Basin Project, Northern Sahara, Centre for Hydraulics and Applied Hydrological Research, Hydrometeorology, Seine River (France), Algerian Sahara.

The historical and scientific background of the International Hydrologic Decade is examined with emphasis on international cooperation of inventorying fresh water resources and water efficiency. Water problems include space and time distribution of water, chemical quality, and pollution. Irrigation over 7,000 years, flood plains and cities, Greek hydrology, and Roman to Renaissance contributions are reviewed. A world water budget is developed under a world approach to the water crisis. Arid and humid land water problems are sketched. Examples of international cooperation include the Chad Basin Project, groundwater resources study in the Northern Sahara, the Centre for Hydraulics and Applied Hydrological Research, and numerous flood control, irrigation, drainage, hydrometeorological and saline-water conversion activities. Photographs include pancake oases in the Algerian Sahara, Lake Chad, and ancient foggaras or underground tunnels. (Popkin-Arizona)
W71-12124

OIL PUMPS STOP AUTOMATIC SPRINKLER.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 03F.
W71-12132

THE MANAGEMENT OF INTERNATIONAL COMMON PROPERTY RESOURCES,
Washington Univ., Seattle. Dept. of Geography.
William M. Ross.
Geographical Review, Vol 61, No 3, p 325-338, July 1971. 22 ref.

Descriptors: *Natural resources, *International commissions, *International law, *Exploitation, *Pollution, International waters, International boundary commission, International bound and water commission, Foreign countries, Fisheries.

'Common property resources' are defined as those outside the jurisdiction of nation-states or as those whose fluidity and mobility bring them under the control of several nations. Poor planning, inefficient exploitation and lack of cooperation between concerned nations have complicated and limited resource usefulness. Nations have not been able to maximize resource exploitation by cooperation, but have at least been able to minimize losses through international management. Common property resources may be viewed in 2 ways: extraction of resources, such as oil or fish, which may at times be uneconomical, but usually adds to man's betterment, and addition of pollutants, through which, ultimately, all lose. Various international agreements and management procedures involving extractive fisheries are reviewed. Most such agreements involve commissions with research and recommendation goals, but very little power to influence policies of the countries involved. Cooperation involving pollution problems has seen even less progress, with the only concrete achievement being the US-USSR agreement on atmospheric nuclear test bans. Air and water pollution problems have been largely ignored. The absence of defined property rights over international common property resources combined with free entry to the commons have resulted in national policies oriented only toward narrow, self-interested economic goals. The major problems can only be solved when national political wills are sufficiently strong enough to suffer some loss of national sovereignty in the interests of resource conservation through international cooperation. (Casey-Arizona)
W71-12139

MANAGING THE ENVIRONMENT: NINE STATES LOOK FOR NEW ANSWERS.
Smithsonian Institution, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-12144

SURVEY OF NEBRASKA WATER LAW.
Nebraska Soil and Water Conservation Commission, Lincoln.

Report on the Framework Study, Appendix D, State Water Plan, Publication No 101D, June 1971. 117 p, 1 fig, 321 ref.

Descriptors: *Nebraska, *Water pollution control, *Water resources development, *Pollution abatement, Administrative agencies, Administration, Regulation, State governments, Jurisdiction, Water quality control, Water pollution treatment, Water pollution, Standards, Local governments, Water districts, Judicial decisions, Water utilization, Legal aspects, Interstate compacts, Sewage disposal, Waste treatment.

Appended to a comprehensive study of Nebraska water management is a survey of Nebraska water law, which provides broad coverage of the laws, government agencies, and programs pertaining to public and private developments, management, and water use. A summary is also made of interstate compacts and court decrees which are important to water resource development. The maintenance of water quality in the state is essentially the responsibility of two state agencies. The Nebraska Soil and Water Conservation Commission is the official state water quality planning agency, while enforcement of water quality standards is the responsibility of the Department of Environmental Control. Judicial decisions dealing with the maintenance of water quality are based almost exclusively on the doctrine of private nuisance. These cases are summarized. Judicial interpretation of the Water Pollution Control Act is yet to come. A summary of the powers and duties of the various state agencies is provided. The activities of federal agencies, such as the Environmental Protection Agency and the Water Resources Council, are detailed. State sanitation drainage districts regulate sewage disposal. Other districts and local governmental units are described. (Smiljanich-Florida)
W71-12145

WATERS AND WATER RIGHTS, WATER POLLUTION AND QUALITY CONTROLS,
For primary bibliographic entry see Field 05G.
W71-12146

WATER POLLUTION -- 1970, PART 2.
For primary bibliographic entry see Field 05G.
W71-12147

AQUACULTURE AND THE LAW,
Miami Univ., Coral Gables, Fla. School of Law.
Edward T. Kane.
October 1969. 98 p.

Descriptors: *Law of the sea, *Jurisdiction, *Water rights, *Aquiculture, Oysters, Federal government, State governments, Governments, Water law, Legal aspects, International law, Public rights, Economics, Regulation, Riparian rights, Aquatic animals, Aquatic productivity, Estuaries, Oceans, Fishing, Navigation, Recreation, Water quality control, Federal jurisdiction, State jurisdiction.

Aquaculture, the use of artificial means to assist the growth and development of aquatic organisms, holds promise as a new food source for the world community. This thesis discusses aquaculture in general and the legal problems which might confront aquaculturalists in pursuit of their activities. The methods and techniques utilized in the culture of oysters, shrimp, plaice, sole, salmon, and trout are described, as well as variances which exist in practices between different countries. Jurisdiction over the high seas areas, the contiguous zone, and the territorial sea and internal water areas is considered. Such jurisdiction is vested in the international community, the coastal nations, or as in the United States, state governments within the coastal nations. Considered next are the conflicts which might arise between the aquaculturist and riparian landowners or those involved in navigation, fishing, recreation, and controlling water quality. These conflicts are discussed in detail with respect to the competing rights involved, what the existing law appears to be, and what changes in the law are desirable if aquaculture is to be encouraged. (Johnson-Florida)
W71-12148

THERMAL POLLUTION: A POTENTIAL THREAT TO OUR AQUATIC ENVIRONMENT,
Maryland Univ., College Park. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 05C.
W71-12149

THE FEDERAL GOVERNMENT AND ENVIRONMENTAL CONTROL: ADMINISTRATIVE REFORM ON THE EXECUTIVE LEVEL,
Boston Coll., Mass. School of Law.
Peter A. Donovan.
Environmental Affairs, Vol 1, No 2, p 299-332, 1971. 34 p, 94 ref.

Descriptors: *Water pollution control, *Legisl tion, *Administrative agencies, *Pollution abat ment, Administrative decisions, Regulatio Federal government, Administration, Adoption practices, Decision making, Supervisory contr (Power), Water quality control, Water pollutio Environment, Political aspects, Institutions, Sta governments, Local governments, Judicial dec sions, Legal aspects.
Identifiers: *National Environmental Policy Act.

In response to increased concern over environme tal pollution, vast administrative reforms have bee effectuated at the national level. A survey is mad of these developments, with particular emphasis o the National Environmental Policy Act. The pu poses and policies of the Act are reviewed. Sub stantive duties under the Act are phrased in manda tory terms, intended to establish a restructuring o the decision-making process and accomplish reordering of priorities. Procedural duties an agency review of existing operations are detailed The duties imposed by the Act should be legall cognizable and subject to judicial review, despit restrictive court rulings. Under expanded concept of standing, it is argued that representatives of th public have standing to enforce the act so as t achieve abatement of water pollution and it deleterious effects. Other related acts and agenc reorganization indicate a national approach to th solution of water pollution control and other en vironmental problems, along with a recognition o the need for state and local implementation o plans. Although administrative reform alone wil not solve the pollution problem, recent cases in dicate that the provisions of the acts may suppor citizen participation in governmental decision making. (Smiljanich-Florida)
W71-12150

LAWS OF THE UNITED STATES RELATING TO WATER POLLUTION CONTROL AND ENVIRONMENTAL QUALITY.
U.S. House of Representatives, Washington, D.C. Committee on Public Works.

Comm on Public Works, US House of Representatives, 91st Cong, 2d Sess (Comm print July 1970) 265 p, 72 ref.

Descriptors: *Federal government, *Water pollution control, *Legislation, *Water quality, Water pollution, Water quality control, Water pollution treatment, Pollution abatement, Water pollution sources, Pollutants, Administrative agencies, Oil, Ships, Standards, State governments, Jurisdiction, Waste treatment, Treatment facilities, Waste disposal, Sewage disposal, Legal aspects, Administration, Water Quality Act.

Legislation developed by the Committee on Public Works in the field of water pollution control is compiled and updated in this Committee print. The national water pollution control program received its major impetus from the Federal Water Pollution Control Act, which: (1) authorized the Surgeon General to assist in and encourage state studies and plans, interstate compacts, and creation of uniform state pollution laws; and (2) established the Federal Water Pollution Control Advisory Board. The various amendments to the Act are set forth including the transfer of responsibility to the Secretary of Health, Education, and Welfare. The water pollution control program was put substantially into present shape by enactment of the Water Quality Act and the Clean Waters Restoration Act which required approved state water quality standards. The acts also provided for research and development grants, seeking better pollution control measures and increasing funding for sewage treatment works. Later water quality acts included major innovations in laws concerning oil pollution from vessels and shore facilities, sewage pollution from vessels, and hazardous discharges into public waters. Recently, major organizational changes have been required by the National Environmental Policy Act. (Smiljanich-Florida)
W71-12151

THE ENVIRONMENTAL LAW HANDBOOK,
Interstate Sanitation Commission, New York.
N. J. Landau, and P. D. Rheingold.
New York, Ballantine Books, 1971. 496 p, 179 ref.

Descriptors: *Water pollution control, *Public rights, *Remedies, *Pollution abatement, Water quality control, Water pollution, Water pollution sources, Water pollution effects, Federal government, State governments, Local governments, Municipal wastes, Industries, Legislation, Judicial decisions, Federal jurisdiction, Riparian rights, Social participation, Air pollution, Environmental effects, Thermal pollution, Legal aspects, Public health, Pollutants.

Citizen suits by private individuals and organizations have proved effective in forcing abatement of water pollution and other forms of environmental degradation. An outline of environmental law is given in order to provide citizens with information on how the legal process can be used to improve the environment. Legal concepts and basic actions which can be used to abate pollution are outlined. An analysis of the written laws, especially federal statutes, demonstrates that these statutes, which form the basis of governmental power to deal with pollution, also make available to private citizens remedies for pollution abatement. Leading cases are discussed, and leading legal articles are summarized. Present suits against industry and the government in the area of water pollution are detailed in order to demonstrate the various methods available to the private citizen. Methods of proof in pollution cases including use of expert testimony and depositions to force the polluter to reveal the extent of is pollution. It is no longer necessary to wait for government to act to alleviate the effects of water pollution. Citizens, using the information in this book, can bring power to bear on the problem. (Smiljanich-Florida)
W71-12152

WATER QUALITY CONTROL (DESIGNATED USES AND CRITERIA).
Pennsylvania Sanitary Water Board, Harrisburg.
For primary bibliographic entry see Field 05G.
W71-12153

WATER POLLUTION CONTROL (DEPARTMENT OF DEFENSE WATER POLLUTION ABATEMENT PROCEDURES).
Department of Defense, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-12154

EVALUATION OF PRELIMINARY APPLICATIONS FOR BASIC WATER AND SEWER FACILITIES GRANTS.
For primary bibliographic entry see Field 05G.
W71-12155

PREVENTING AND CONTROLLING POLLUTION OF THE POTOMAC RIVER.
District of Columbia City Council, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-12156

POWER OF STATE OF INDIANA TO PREVENT POLLUTION OF THE OHIO RIVER.
For primary bibliographic entry see Field 05G.
W71-12157

WATER POLLUTION CONTROL IN NEW YORK,
For primary bibliographic entry see Field 05G.
W71-12158

WATER QUALITY MANAGEMENT,
For primary bibliographic entry see Field 05G.
W71-12159

SOLID WASTE DISPOSAL,
For primary bibliographic entry see Field 05G.
W71-12160

FEDERAL INVOLVEMENT IN POLLUTION CONTROL,
For primary bibliographic entry see Field 05G.
W71-12161

THE LEGISLATIVE PROCESS,
For primary bibliographic entry see Field 05G.
W71-12162

OBSERVATIONS ON FLORIDA'S AQUACULTURE LAW,
Dorian Cowan.
Remarks, TRIGOM Conference on Aquaculture, Durham, New Hampshire (October 22, 1970). 7 p.

Descriptors: *Florida, *Aquiculture, *Legal aspects, *Administrative agencies, Federal government, State governments, Navigation, Warning systems, Non-consumptive use, Navigable waters, Agriculture, Riparian rights, Facilities, Remedies, Leases, Exploitation, Water law, Legislation, Administrative decisions, Water pollution sources, Water pollution, Water pollution control, Regulation.
Identifiers: *Constitutionality.

Florida, the first state to adopt legislation to authorize aquaculture in the water column, gave insufficient consideration to the totality of legal consequences of aquacultural enterprises. The new law fails to require aquaculturists to acquire a permit from the Corps of Engineers, although state aquaculture is clearly subservient to the federal navigational power. Since lights are not required to mark leased areas at night, fenced areas may be navigational hazards. Furthermore, where the aquacultural activity interferes with vested riparian rights, there may be an unconstitutional taking without compensation. The new aquaculture law also fails to prohibit the use of harmful chemicals and other chemicals in connection with aquaculture. The public notice and hearing provisions of the law allow property owners within 1000 feet of the project to enter objections; this limitation fails to provide a proper forum for considerations of the views of other affected interests, such as fishermen. Aquaculture requires extensive on-shore installations, but the Florida law fails to permit county authorities to disapprove of these facilities. The act also has no affirmative requirement for competitive bidding on aquaculture leases. Finally, the law may be an unconstitutional exploitation of state property for private use, unless each lease is found to be in the public interest. (Hart-Florida)
W71-12163

MINE DRAINAGE CONTROL MEASURE AND MINE WASTE CONTROL PROGRAM.
Illinois Dept. of Public Health, Springfield. Div. of Sanitary Engineering.
For primary bibliographic entry see Field 05G.
W71-12164

WATER QUALITY CRITERIA ON INTER AND INTRA STATE STREAMS.
West Virginia Dept. of Natural Resources, Charleston. Div. of Water Resources.
For primary bibliographic entry see Field 05G.
W71-12165

THE ENVIRONMENT: WHAT ILLINOIS STATE GOVERNMENT IS DOING ABOUT IT.
Illinois Environmental Protection Agency, Springfield.
R. B. Ogilvie.
No date, 4 p.

Descriptors: *Illinois, *Water pollution control, *Pollution abatement, *Administrative agencies, Water pollution, Air pollution, Water pollution sources, Water pollution treatment, State governments, Planning, Pollutants, Regulation, Administration, Sewage treatment, Thermal pollution, Water quality control, Economic impact/ Financing, Government finance, Legal aspects, Treatment facilities, Municipal wastes.

A short summary is provided of current state pollution problems and programs for pollution abatement. The State Environmental Protection Agency controls air, water, land, and noise pollution, as well as protecting public water supplies. The Anit-Pollution Bond Act provides state financing to assist local governments in constructing municipal sewage treatment and solid waste facilities. The Pollution Control Board adopts regulations of general applicability limiting pollution and imposes penalties on discovered violators. Regulations pertaining to water have been tightened. Mercury pollution is a current problem. The Institute for Environmental Quality is the center for state environmental research and planning. Institute projects include studies of environmentally sound state purchasing, the use of sewage sludge to reclaim land, securing combined sewer overflows, and upgrading state powerplants. Pollution is a highly complex social and legal problem, but, above all, it is an economic problem. The cost of cleaning up our environment will not be small, yet the cost of not facing our task will be much greater. (Smiljanich-Florida)
W71-12166

CONTROL OF INDUSTRIAL WATER POLLUTION IN NEW MEXICO,
For primary bibliographic entry see Field 05G.
W71-12167

FEDERAL WATER POLLUTION CONTROL ACT AS APPLIED TO THE CITY AND COUNTY OF HONOLULU,
For primary bibliographic entry see Field 05G.
W71-12168

STATEWIDE STANDARDS AND CRITERIA FOR MANAGEMENT OF FLOOD PLAINS AREAS OF MINNESOTA.
Minnesota Dept. of Natural Resources, St Paul.
For primary bibliographic entry see Field 06F.
W71-12169

POLLUTION CONTROL: WHY HAS IT FAILED,
For primary bibliographic entry see Field 05G.
W71-12170

IMPLEMENTING PUBLIC WATER SUPPLY REGULATIONS,
For primary bibliographic entry see Field 05F.
W71-12171

WILL WE EVER HAVE CLEAN WATER,
For primary bibliographic entry see Field 05G.
W71-12172

THE COORDINATED PROGRAM FOR THE WATER RESOURCES OF NEW YORK STATE.
New York State Water Resources Commission, Albany. Div. of Water Resources.
For primary bibliographic entry see Field 06B.
W71-12173

WATER QUALITY STANDARDS (INTERSTATE WATERS: ROCK RIVER, FOX RIVER, DES PLAINES RIVER, KANKAKEE RIVER, AND CERTAIN NAMED INTERSTATE TRIBUTARIES).
Illinois Sanitary Water Board, Springfield.
For primary bibliographic entry see Field 05G.
W71-12174

WATER QUALITY STANDARDS (INTERSTATE WATERS, MISSISSIPPI RIVER COMMON BOUNDARY BETWEEN ILLINOIS AND IOWA).
Illinois Sanitary Water Board, Springfield.
For primary bibliographic entry see Field 05G.
W71-12175

WATER QUALITY STANDARDS (INTERSTATE WATERS, MISSISSIPPI RIVER BETWEEN ILLINOIS AND MISSOURI).
Illinois Sanitary Water Board, Springfield.
For primary bibliographic entry see Field 05G.
W71-12176

MUNICIPAL POWERS UNDER HOME RULE CHARTERS.

Texas Civil Statutes Ann art 1175 (1963) as amended (Supp 1970).

Descriptors: *Texas, *Public utilities, *Water pollution control, *Local governments, Legislation, Public health, Zoning, Regulation, Water pollution sources, Sewers, Drains, Storm drains, Sewage disposal, Water supply, Reservoirs, Streams, Water sources, Pollution abatement, Municipal wastes, Treatment facilities, Cities, Eminent domain.

By the adoption of a home rule charter, a Texas municipality may exercise the following, among many, enumerated powers: (1) condemn private property for the construction of sewer systems, disposal plants, storm drains, reservoirs, watersheds, wells, and other water supply sources; (2) define and prohibit nuisances and the pollution of streams, drains, and water sources and provide for the policing of the same; (3) require the erection of a sanitary sewer with property owners being required to connect in order to avoid polluting water sources; and (4) promote public health by summarily abating and removing nuisances. (Rees-Florida)
W71-12178

ENVIRONMENTAL PROTECTION ACT.
Fla Laws, Ch 71-343 (1971).

Descriptors: *Florida, *Legal aspects, *Administrative agencies, *Remedies, Water pollution control, Water pollution, Regulation, State governments, Adjudication procedure, Judicial decisions, Legislation, Pollution abatement, Costs, Local governments.

The department of legal affairs, any political subdivision of the state, or any citizen of the state may seek an injunction against any governmental agency charged with enforcing laws or regulations for the protection of the state's natural resources, to compel such governmental authority to enforce such laws or regulations. The same class of complainants may seek to enjoin the violation by any party of such laws and regulations. The department of legal affairs may intervene for the state. Conditions precedent to suit are: (1) a verified complaint outlining the manner in which the complaintant is being affected, (2) transmission of the complaint by the governmental agency to the alleged offender, and (3) failure of the agency to act within 30 days. No action may be maintained if the person or governmental agency charged is acting in compliance with a current valid permit. The prevailing parties in action under this statute are entitled to costs and attorney fees. The court may grant an injunction with conditions imposed as allowed by law or the regulations of a state or local agency. In any administrative licensing hearing the aforesaid persons and entities may intervene after filing pleadings asserting that the proposed activity will injure the environment. (Rees-Florida)
W71-12179

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION, MAUNABO RIVER, VICINITY OF MAUNABO, PUERTO RICO.
Corps of Engineers, Jacksonville, Fla.
For primary bibliographic entry see Field 04A.
W71-11786

FLOOD PLAIN INFORMATION, LIMESTONE CREEK, MANLIUS TOWNSHIP, ONODAGA COUNTY, NEW YORK.
Corps of Engineers, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W71-11791

FLOOD PLAIN INFORMATION, NEW RIVER, BAYOU FRANCOIS AND BLACK BAYOU, GONZALES AREA, LOUISIANA.
Pyburn and Odom, Baton Rouge, La.
For primary bibliographic entry see Field 04A.
W71-11997

THE FEDERAL GOVERNMENT AND ENVIRONMENTAL CONTROL: ADMINISTRATIVE REFORM ON THE EXECUTIVE LEVEL,
Boston Coll., Mass. School of Law.
For primary bibliographic entry see Field 06E.
W71-12150

STATEWIDE STANDARDS AND CRITERIA FOR MANAGEMENT OF FLOOD PLAINS AREAS OF MINNESOTA.
Minnesota Dept. of Natural Resources, St Paul.

Minnesota Regulations, Ch 7, 1970. 20 p.

Descriptors: *Minnesota, *Flood plains, *Flood plain zoning, *Regulation, Flood protection, Floodways, Standards, Flood control, Building codes, Warning systems, State governments, Local governments, Administration, Hydraulics, Hydrologic aspects, Water pollution, Water pollution control, Waste treatment.

These regulations establish minimum flood plain management standards which apply to land adjacent to all watercourses of the state unless otherwise provided. The standards for the management of flood prone areas and uses located therein pertain to all watercourses where the drainage area is over two square miles and where the commissioner finds other watercourses creating significant flood hazards. Technical standards are stated for determination of extreme flooding events, flood frequency techniques, and hydrologic and hydraulic techniques. Permitted land uses for floodways are enumerated. Supplemental measures for flood plain management should be included in local governmental programs and adopted in addition to local zoning ordinances where sufficient technical data and resources are available. Such standards include subdivision regulations, building codes, sanitary regulations, warning signs and public information regulations, and measures for flood control. All state and local governmental units must apply the standards in the construction of facilities. Variance is allowed where it appears that by reason of exceptional circumstances strict enforcement would cause undue hardship and strict conformity would be impractical. Sanitary regulations must provide measures to prevent introduction of pollutants into flood waters. (Shelnut-Florida)
W71-12169

6G. Ecologic Impact of Water Development

A STUDY OF SUBMERGED DREDGE HOLES IN NEW JERSEY ESTUARIES WITH RESPECT TO THEIR FITNESS AS FINFISH HABITAT,
New Jersey Dept. of Conservation and Economic Development, Trenton. Nacote Creek Research Station.
Walter S. Murawski.
Miscellaneous Report No 2 M, Oct 1969. 32 p, 6 tab, 3 ref, 2 append.

Descriptors: *Aquatic habitats, *Deep water habitats, *Dredging, *Fish, *Aquatic environment, *New Jersey, *Water quality, Marsh management, Habitats, Overwintering sites, Biomes, Ecology, Environmental effects, Potholes, Fish management, Fish establishment, Estuarine fisheries, Marine fisheries, Fish behavior.
Identifiers: *Dredge holes, *Dredging effects.

Thiry-eight submerged dredge holes in New Jersey estuaries were examined. Water quality parameters recorded were temperature, salinity, dissolved oxygen concentration and hydrogen sulfide concentration. The bottom muds of 33 of these holes were examined for their invertebrate fauna. Of the 38 holes, 21 had dissolved oxygen and/or hydrogen sulfide conditions in their bottom waters that could not sustain healthy fish life. Of the 33 holes examined for invertebrate fauna, 20 lacked any bottom invertebrates. High amounts of organic matter and high concentrations of soluble ferrous and manganese ions in the muds were associated with stagnant holes. The reasons given for the cause of stagnation of these holes include: (1) great depth relative to the surrounding water, (2) intrusion of poor quality groundwater, (3) high accumulation of detritus, and (4) prevention of mixing by the wind because of the sheltering effect of the shoreline. (LeGore-Washington)
W71-11649

PUBLIC HEALTH ASPECTS OF IODINE-129 FROM THE NUCLEAR POWER INDUSTRY,
For primary bibliographic entry see Field 05B.
W71-11666

DARIENITA'S DIETARY (BIOENVIRONMENTAL AND RADIOLOGICAL-SAFETY FEASIBILITY STUDIES. ATLANTIC-PACIFIC CANAL),
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 05C.
W71-11671

ECOLOGY AND RESOURCE ECONOMICS: AN INTEGRATION AND APPLICATION OF THEORY TO ENVIRONMENTAL DILEMMAS,
Oak Ridge National Lab., Tenn.
Duane Chapman, and Robert V. O'Neill.
Available from NTIS as ORNL-4641, $3.00 in paper copy, $0.95 in microfiche. ORNL-4641 (Reprinted as ORNL-NSF-EP-4, April 1971), December 1970. 36 p, 3 fig, 7 tab, 10 ref.

Descriptors: *Ecology, *Economics, *Resources, Pollution abatement, Electric power costs, Public benefits, Sites, Environmental engineering, Environmental effects, Optimization, Resource allocation, Economic efficiency.

A hierarchical classification scheme has been used to develop the concept of a functional system linking relevant knowledge in both economics and ecology. As an example, power production is described within a matrix consisting of (a) five energy sources, (b) six stages of production and distribution, and (c) their interactions with ecosystems and nonmarket costs. Nonmarket costs are the basis for anticipating divergence between social and market equilibria: examples are brownouts, power plant siting controversies, and

various forms of pollution. The theory of expected utility maximization is used herein to suggest that uncertainty pertaining to power needs increases the expected social cost of new capacity. We conclude with the suggestion that this research may serve as an introduction to a comprehensive analysis of power production and public policy. (Bopp-NSIC)
W71-11673

THE GREAT ENVIRONMENTAL DEBATE AND THE POWER INDUSTRY.
IEEE Power Engineering Society.

71 M 31-PWR, Spec Publ No 1, Institution of Electrical and Electronics Engineers, Power Engineering Section, 1970. 29 p, 3 fig, 6 tab, 11 ref.

Descriptors: *Environmental effects, Environmental engineering, Costs, *Electric power industry, *Pollution control, Aesthetics, *Environments, *Technology, Electric power production, Research and development, Water pollution, Economics, Policies, Transmission (Electrical), Population growth, Planning, Nuclear energy, Thermal pollution, Air pollution.
Identifiers: Power spectra.

The electric power industry faces the dilemma of supplying ever-increasing quantities of electric energy vital to mankind while, at the same time, controlling to viable limits pollution of the environment. The importance and significance of energy and electric energy in our society are discussed. Basic choices to be adopted toward development of a program of compatibility between energy use and a protected viable environment are: (1) a commitment to stop abuse of our environment; (2) rejection of the contention that the earth is doomed; (3) no panic--accept the job and do it without procrastination; (4) determine how and proceed to reverse the trend of environmental deterioration; (5) clean up accumulated damage; (6) accept the fact that the work involved will be expensive and take time, maybe 30 yr or more; and (7) continue to be even stronger than we now are--spiritually, ethically, productively, and with unremitting dedication. A program of action to implement a broad-gage public policy in electric power is outlined. Comments by panelists and audience participation are included. (USBR)
W71-11820

MEASURING THE INTANGIBLE VALUES OF NATURAL STREAMS, PART I: APPLICATION OF THE UNIQUENESS CONCEPT.
Kentucky Water Resources Inst., Lexington.
John A. Dearinger, and George M. Wollwine.
Available from the National Technical Information Service as PB-202 416, $3.00 in paper copy, $0.95 in microfiche. Research Report No. 40, June 1971, 86p, 5 fig, 14 tab, 35 ref. OWRR Project B-015-KY (1).

Descriptors: *Natural streams, *Evaluation, *Esthetics, *Natural resources, Streams, Rivers, Scenery, *Wildrivers, *Kentucky, Land use, Water quality, Environmental effects, Environment.
Identifiers: *Uniqueness concept, *Scenic rivers, Eastern Coal Field (Kentucky), Western Coal Field (Kentucky), Quantitative evaluations.

The 'uniqueness concept' to the quantification of the intangible values of natural streams. The methodology is based on procedures developed by Luna B. Leopold and Maria O. Marehand of the U. S. Geological Survey. (See W69-00702 and W70-04101). It involves the evaluation of a set of characteristics or factors for selected stream sites. The present study utilized an inventory of fifty-four factors which were evaluated for each study stream. The inventory was divided into five factor groups: Physical Measures, Land Use Measures, Water Quality Measures, Disvalues and Esthetic Impression Measures. Two types of streams were studied: Preference streams and Randum streams. Sixteen Preference streams were selected from lists of wild, scenic and recreational streams prepared by two state agencies. Forty-two Random streams were selected, using a random number table, from a small watershed inventory prepared by the U.S. Soil Conservation Service. The sampling process insured that streams be selected from each of the eight physiographical regions of Kentucky. Thus, a total of fifty-eight streams were studied. Conclusions reached were: (1) The 'uniqueness ratio' concept can successfully be used to evaluate 'relative uniqueness' within a group of streams. (2) Higher values of the 'total uniqueness ratio' were obtained for those streams that were in 'bad' condition or that had been abused by man's activities than for those streams that were of relatively high quality. (3) Some of the streams ranking highest in 'total uniqueness' were those situated in highly developed areas, an indication of the essentially rural nature of the state of Kentucky and the effects of development and urbanization on the environmental quality of small watersheds. (4) Streams located in the Eastern Coal Field generally represented the most natural, rugged, and esthetic streams of the study. (5) The streams located in the Western Coal Field generally represented the most highly exploited and least esthetic streams of the study.
W71-11859

PALEOECOLOGY OF SHELL MOUNDS AT OTUMA, PERU,
Florida Atlantic Univ., Boca Raton; and Rutgers-The State Univ., New Brunswick, N.J. Dept. of Geography and Geology.
A. K. Craig, and N. P. Psuty.
Geographical Review, Vol 61, No 1, p 125-132, January 1971. 4 fig, 8 ref.

Descriptors: *Paleoclimatology, *Ecology, *Shores, *Arid lands, *Geomorphology, Lagoons, Climatic data, On-site investigations, History, Human resources, Habitats.
Identifiers: *Peru, *Paleoecology, *Shell mounds, *Atacama Desert.

Otuma is a raised coastal embayment or lagoon floor encompassing about 2.5 square miles of extremely arid wasteland along the south-central coast of Peru where precipitation records indicate a mean annual rainfall of 1-2 inches/year. The embayment was apparently used by early man until about 3600 B.P. when the lagoon was stranded by a sudden uplift that destroyed it's shellfish beds, causing aboriginal abandonment. Vegetation and wind erosion are lacking, so the habitation sites (sheel mounds), and their geomorphic associations are well preserved. Form assemblages at the modern shoreline indicate that all displacements are solely the product of tectonic mobility. At least 31 conspicuous shell mounds (conchales) are located resting on shale bedrock around the 6-mile perimeter of the dry lagoon bed. Each mound consists of uncompacted masses of scallop valves loosely held in a matrix of sand and windblown silt. The uniformity of the material is striking and there appears to be no significant interruption of the conchales with time. Pottery remains, lithologic artifacts and domesticated plant materials are strikingly rare or lacking. Surface examinations indicate the mounds were not used as burial sites. In view of the physiological problems presented by an all-scallop diet and the probable lack of potable water, it is felt that the site may represent a regularly frequented fishing camp. Since the scallop valves are too large to be transported from their present site by eolian activity alone, indicating their former ecological habitat is identical with their current habitat. It appears that the present inhospitality of the Peruvian coast is not the result of climatic degeneration. The past sources of fresh water are unknown. (Casey-Arizona)
W71-12108

WINDMILLS, PLAINS, AND PEOPLE,
Texas Tech. Univ., Lubbock.
David B. Gracy, II.
Cross Section, Vol 16, No 9, September 1970, p 3-4. 3 fig.

Descriptors: *History, *Water wells, *Water supply, *Water resources development, *Cultivated lands, Texas, Costs, Groundwater, Riparian rights, Arid lands, Irrigation practices.
Identifiers: *Windmills, Semi-arid lands.

The cultural history of the windmill well in West Texas is discussed. Mills made the arid and semi-arid west inhabitable. The average mill cost $1000 to $2000 installed, with a higher price for the initial well on a range. The first Texas mills were installed after 1880, and quickly became common. Mills were a sign of human habitation, and provided a dependable water supply. Windmills brought peaceful coexistence because groundwater belonged to the landowner under the riparian rights doctrine. The mill is passing into a chapter of western folklore. (Popkin-Arizona)
W71-12138

MANAGING THE ENVIRONMENT: NINE STATES LOOK FOR NEW ANSWERS,
Smithsonian Institution, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-12144

LAWS OF THE UNITED STATES RELATING TO WATER POLLUTION CONTROL AND ENVIRONMENTAL QUALITY.
U.S. House of Representatives, Washington, D.C. Committee on Public Works.
For primary bibliographic entry see Field 06E.
W71-12151

07. RESOURCES DATA

7A. Network Design

SAMPLED DATA RECONSTRUCTION ERRORS,
Arizona Univ., Tucson.
John V. Wait.
Instruments and Control Systems, Vol. 43, No 6, p 127-129, June 1970. 4 fig, 5 tab, 9 ref.

Descriptors: *Data transmission, *Sampling, Monitoring, Data collections, Data processing.

Electronic measurement systems generally are hybrid systems consisting of analog and digital equipment which sample a continuous signal and reconstruct the data to produce the continuous signal. Since reconstruction is based upon a relatively few values, there are errors in the reconstructed plots which may be quite large if sampling frequency is inadequate. A number of equations are included in this paper to enable one to calculate the reconstruction errors for a given sampling frequency and to calculate the sampling frequency required for given accuracy. (Little-Battelle)
W71-11831

CONDUCTION ERROR IN TEMPERATURE SENSORS,
Rosemount Engineering Co., Minneapolis, Minn.
Mohan Dutt, and Truman Stickney.
ISA Transactions, Vol. 9, No. 2, p 81-87, 1970. 10 fig, 9 ref.

Descriptors: *Monitoring, *Thermometers, *Design criteria, Measurement, Temperature, Data collections.

Errors in temperature measurements made with sensors occur because of conduction of heat into or out of the system under investigation. These errors can be minimized by proper design and installation of the sensor as discussed in this report. Remaining conduction errors can be estimated by using mathematical models such as those considered. The results obtained from the models are compared to estimates of conduction errors obtained by considering a simple electrical analog circuit. (Little-Battelle)
W71-11839

STATISTICS AND EXPERIMENTAL DESIGN,
Sussex Univ., Brington (England). Mathematics Div.
Geoffrey M. Clarke.
American Elsevier Publishing Company, Inc., New York, 1969. 16 p.

Descriptors: *Statistical methods, Poisson's ratio, Linear programming, Regression analysis, Correlation analysis, Equations, Probability, Mathematics, Statistical models.
Identifiers: Experimental design.

This book presents the common statistical methods used in biological research and explains their applications and reasons for using them. Because it is often possible, in biology, to plan in detail the collection of data and the conduct of experiments, emphasis is placed on the elementary aspects of experimental design. (Mortland-Battelle)
W71-11842

A COMPARISON OF BENTHIC MACROINVERTEBRATES COLLECTED BY DREDGE AND BASKET SAMPLER,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Div. of Pollution Surveillance.
For primary bibliographic entry see Field 05A.
W71-11960

7B. Data Acquisition

SPECIFIC ION ELECTRODES,
For primary bibliographic entry see Field 02K.
W71-11684

HOW AERIAL PHOTOGRAPHS CAN IDENTIFY AND MEASURE POLLUTANTS,
Cornell Aeronautical Lab., Buffalo, N.Y.
For primary bibliographic entry see Field 05A.
W71-11685

AUTOMATED NUTRIENT ANALYSES IN OCEANOGRAPHY,
Coast Guard, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 05A.
W71-11691

DETERMINATION OF NITRATE IN WATERS WITH THE NITRATE-SELECTIVE ION ELECTRODE,
Wisconsin Univ., Madison. Dept. of Soils.
For primary bibliographic entry see Field 05A.
W71-11702

DISSOLVED OXYGEN SAMPLER,
Wastewater Treatment Engineer, San Antonio, Tex.
W. N. Wells.
Water and Sewage Works, Vol 117, No 8, p 282-283, Aug 1970. 4 fig.

Descriptors: *Sampling, *Dissolved oxygen, Mechanical equipment.

A method is shown for constructing a dissolved oxygen sampler from a fruit jar and tubing. The method of using the sampler is described; specific procedures are explained in the 12th edition of Standard Methods for the Examination of Water and Wastewater, p 405-406.
W71-11703

RAPID DETECTION OF MICROORGANISMS IN AEROSPACE WATER SYSTEMS,
Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
For primary bibliographic entry see Field 05A.
W71-11706

FLUSHING OF THE GERARD-EWING LARGE-VOLUME WATER SAMPLER,
Heidelberg Univ. (West Germany). Physikalisches Institut (II).
W. Roether.
Journal of Geophysical Research, Vol 76, No 24, p 5910-5912, August 20, 1971. 2 fig, 1 ref.

Descriptors: *Sampling, *Equipment, Calibrations, Tracers, Sea water, Instrumentation, Mixing, Water chemistry.
Identifiers: *Water samplers.

Flushing characteristics of a modified Gerard-Ewing oceanic water sampler (270 liters volume) were examined using Rhodamine B tracer. It was found that 90% of the tagged water content of the sampler was replaced during the first 20 meters of lowering; 1% of the tracer remained at a 40-meter depth, 0.1% at a 100-meter depth. (Knapp-USGS)
W71-11747

SOME APPLICATIONS OF THERMOHYGROMETRIC ANALYSIS TO THE STUDY OF CLAY AND ASSOCIATED MINERALS,
General Electric Co., Ltd., Wembley (England). Hirst Research Centre.
For primary bibliographic entry see Field 02G.
W71-11749

PROBLEMS OF HYDROLOGIC INSTRUMENTATION (Voprosy gidrologicheskogo priborostroyeniya).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 186, Leningrad, 1970. 56 p.

Descriptors: *Instrumentation, *Flow measurement, *Discharge measurement, *Design data, *Foreign research, Flumes, Current meters, Ice, Evaporators, Gages, Floats, Flow rates, Velocity, Hydrometry, Calibrations, Water levels, Model studies, Water level fluctuations, Cores, Subsurface investigations.
Identifiers: *USSR, *State Hydrologic Institute, Leningrad Oblast, *Ice drills, Slush ice, Core samples, Pygmy current meters, Probes, Float velocity, Ice cover.

This collection of seven papers examines the design and specifications of a number of hydrologic instruments recently developed by the Leningrad State Hydrologic Institute. The instruments examined include a rectilinear calibration flume for experimental studies in the field of hydrometry, a pygmy current meter for discharge measurements in the laboratory and in the field, a gravimetric evaporator for measuring evaporation from water-covered bog surfaces, a portable bore-hole sensing probe for measurement of water levels, and a new ice rod for measuring the depth of slush ice under ice cover. Considerable attention is given to analytical and laboratory studies on the use of integrating floats for making discharge measurements. (See also W71-11763 thru W71-11769) (Josefson-USGS)
W71-11762

A RECTILINEAR CALIBRATION FLUME (Pryamolineynyy tarirovochnyy basseyn),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
K. D. Zav'yalov, and P. N. Burtsev.
In: Voprosy Gidrologicheskogo Priborostroyeniya, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 186, p 3-7, Leningrad, 1970. 1 fig.

Descriptors: *Flumes, *Calibrations, *Instrumentation, Measurement, Hydrometry, Current meters, Flow measurement, Design data.
Identifiers: *USSR, *State Hydrologic Institute, Leningrad Oblast, Vyborg Rayon.

A new improved rectilinear calibration flume designed in September 1969 by the Instrumen Design Branch of the State Hydrologic Institute a its main experimental base at Il'ichevo, Vyborg Rayon, Leningrad Oblast, is described. The new flume is 150 m long, 4 m wide and 3.2 m deep. The rectilinear flume is intended for detailed experimental investigations of hydrologic instruments, including intensive studies on the calibration of current meters. (See also W71-11762) (Josefson-USGS)
W71-11763

ANALYTICAL AND LABORATORY INVESTIGATIONS ON THE USE OF INTEGRATING FLOATS FOR DISCHARGE MEASUREMENTS (Analiticheskiye i laboratornyye issledovaniya po primeneniyu poplavkov-integratorov dlya izmereniya raskhodov vody),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
G. M. Rimmar.
In: Voprosy Gidrologicheskogo Priborostroyeniya, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 186, p 8-29, Leningrad, 1970. 4 fig, 7 tab, 3 ref.

Descriptors: *Floats, *Instrumentation, *Discharge measurement, Hydrometry, Surface tension, Drops (Fluids), Floating, Specific gravity, Velocity, Flow rates, Turbulent flow.
Identifiers: USSR, State Hydrologic Institute, Float velocity.

The feasibility of using a device which provides for stream gaging by immediate release from a streambed of solid and liquid bodies of different size and float velocity, whose specific gravity is less than that of water, is examined. Solid bodies such as ping-pong balls and liquid bodies which are not readily soluble in water may be used as floats. The formation of a liquid integrating float as the result of a discharge of a mixture of oils into tranquil water is examined in connection with establishing a relationship between the float velocity of the float and the specific gravity of the mixture. The float velocity of a liquid integrating float formed during slow discharge of a kerosene mixture into water is essentially unaffected by the temperature of the water as long as the specific gravity of the mixture does not exceed 0.955 g/cu m. (See also W71-11762) (Josefson-USGS)
W71-11764

THE GR-96 PYGMY CURRENT METER (Mikrovertushka GR-96),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
P. N. Burtsev and A. G. Levchenko.
In: Voprosy Gidrologicheskogo Priborostroyeniya, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 186, p 30-34, Leningrad, 1970. 2 fig, 4 ref.

Descriptors: *Current meters, *Instrumentation, *Flow measurement, Discharge measurement, Discharge (Water), Velocity, Hydrometry, Turbulent flow, Model studies.
Identifiers: USSR, State Hydrologic Institute, Pygmy current meters.

The GR-96 pygmy current meter, designed by the State Hydrologic Institute for measuring flow velocity in shallow streams and for conducting model studies under laboratory conditions, is examined. The new pygmy meter differs from existing types in that it can measure velocities at an obliquity of flow of 30 deg to the axis of the instrument, with an error not exceeding 5%. The amplifier circuit of the instrument makes it possible to operate the meter within a wide range of salinity values (up to 8,000 mg/liter). (See also W71-11762) (Josefson-USGS)
W71-11765

A GRAVIMETRIC EVAPORATOR FOR BOG CORE SAMPLES (Vesovoy bolotnyy isparitel's peremeshcheniyem monolita),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
I. L. Kalyuzhnyy and V. I. Yakovlev.
In: Voprosy Gidrologicheskogo Priborostroyeniya, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 186, p 35-39, Leningrad, 1970. 3 fig.

Descriptors: *Evaporators, *Instrumentation, *Evaporation, Bogs, Cores, Sampling, Gravimetry, Water levels.
Identifiers: USSR, State Hydrologic Institute, Core samples.

The GR-93 gravimetric evaporator was designed for measuring evaporation from water-covered bog surfaces. The amount of water lost to evaporation is determined in the evaporator by the amount of water required to maintain a prescribed water level. The size of the assembled evaporator is 1,220 x 629 x 484 mm; the area of the evaporation surface is 1,000 plus or minus 6 sq cm; the height of the core sample is 51 cm; and the limit to which the sample can be lowered is 18 cm of water above the bog surface. Experimental models of the GR-93 evaporator, built by the State Hydrologic Institute in 1969, are being tested at a number of bog stations in the USSR. (See also W71-11762) (Josefson-USGS)
W71-11766

A PORTABLE WATER-LEVEL SENSING PROBE (Reyka perenosnaya kontaktnaya),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
V. I. Yakovlev.
In: Voprosy Gidrologicheskogo Priborostroyeniya, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 186, p 40-44, Leningrad, 1970. 2 fig.

Descriptors: *Gages, *Water levels, *Instrumentation, *Measurement, Water level fluctuations, Borehole geophysics, Subsurface investigations.
Identifiers: USSR, State Hydrologic Institute, Probes.

The design and specifications of a GR-92 portable water-level sensing probe, developed by the Instrument Design Branch of the State Hydrologic Institute for measurement of water levels, are examined. The size of the GR-92 probe is 1,475 x 62 x 51 mm and its weight is 1.2 kg; the measurable range of water-level changes is 1,000 mm and the water-level measurement error is plus or minus 1 mm. The water-level measuring device may be used in borehole geophysical logging and in cases where portability between test sites is essential. (See also W71-11762) (Josefson-USGS)
W71-11767

A NEW ICE ROD (GR-85) (Novaya shugomernaya reyka GR-85),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
G. M. Rimmar and A. N. Chizhov.
In: Voprosy Gidrologicheskogo Priborostroyeniya, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 186, p 45-49, Leningrad, 1970. 2 fig.

Descriptors: *Instrumentation, *Frazil ice, *Measurement, Ice, Discharge (Water), Ice-water interfaces, Hydrometry.
Identifiers: USSR, State Hydrologic Institute, *Ice rods, Slush ice, Ice cover.

A new ice rod (Gr-85) was developed in 1968 by the Instrument Design Branch of the State Hydrologic Institute for measuring the depth of slush ice. The GR-85 ice rod consists of an ice-sensitive element, an audio-frequency transistor, a two-wire cable connecting the element to the transistor, a set of headphones, and two 3-meter Duralumin sections. The GR-85 ice rod may also be used to determine the movement of slush ice under ice cover. (See also W71-11762) (Josefson-USGS)
W71-11768

ICE EQUIPMENT FOR HYDROMETRIC STUDIES FROM ICE COVER (Kompleks prisposobleniy dlya zimnikh gidrometricheskikh rabot s podvesnoy shtangi s poverkhnosti ledyanogo pokrova (PI-15)),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
G. M. Rimmar.
In: Voprosy Gidrologicheskogo Priborostroyeniya, Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 186, p 50-53, Leningrad, 1970. 1 fig.

Descriptors: *Instrumentation, *Flow measurement, *Ice, Ice-water interfaces, Current meters, Hydrometry, Flow rates, Velocity.
Identifiers: USSR, State Hydrologic Institute, Ice cover, Flow velocities, Ice drills, Ice rods.

A number of devices for conducting hydrometric studies from ice cover to simplify work on rivers of 4 m depth with flow velocities of 1.0-1.5 m/sec are described. These devices include a reamer attached to a GR-7 hand ice drill and used to increase the diameter of ice holes from 70 to 140 mm; an adapter consisting of a suspension bar with a hinged end for rotating a GR-21 current meter into a horizontal position; and a support inserted into the ice hole for holding the meter horizontally during measurement of flow velocities. A PI-15 adapter, developed by the Instrument Design Branch of the State Hydrologic Institute in 1968-69, incorporates a remodeled suspension linkage and a 180-mm diameter ice drill (PI-8) developed by the Arctic and Antarctic Scientific Research Institute, for work in an ice thickness of less than 1.6 m. (See also W71-11762) (Josefson-USGS)
W71-11769

FIELD STUDY OF EVAPORATION - INSTALLATION, OPERATION, AND MAINTENANCE OF EQUIPMENT.
Snowy Mountains Engineering Corp. Canberra (Australia).
For primary bibliographic entry see Field 02D.
W71-11771

PHOTOGRAMMETRIC TECHNIQUES APPLICABLE TO EARTH RESOURCES ANALYSES.
National Aeronautics and Space Administration, Huntsville, Ala. George C. Marshall Space Flight Center.
Paul A. Larsen.
National Aeronautics and Space Administration Technical Memorandum NASA TM X-64546, Aug 21, 1970. 59 p, 21 fig, 6 tab, 15 ref.

Descriptors: *Photogrammetry, *Topography, *Aerial photography, *Satellites (Artificial), *Terrain analysis, Surveys, Radar, Infrared radiation, Water resources, Conservation, Reviews, Water pollution, Air pollution, Monitoring, Remote sensing, Instrumentation, Mapping, Photometry.
Identifiers: Earth resources analysis.

Applications of photogrammetry to studies of earth resources and earth problems, including the earth environment, are listed. Photogrammetric measuring techniques are used to obtain elevation differences between various points visible on stereograms constructed from Apollo 6 and Apollo 8 earth orbital and lunar orbital photographs. Topographic information is inferred from stereograms, prepared from orbital photographs of southwest New Mexico and is presented with the methods used for photographic interpretations. Skylab Experiment S-190, 'Six Camera Multispectral Photography,' is discussed, and a graphical analysis showing the percentage of ground observable by the Skylab cameras through various percentages of cumulus cloud coverages is reported. Several recent photogrammetric projects completed by universities, private industry, and government agencies are reviewed briefly. Pertinent stereograms, a radar image, and an image prepared by infrared line-scanning techniques are shown, along with relevant photographic interpretations. (Knapp-USGS)
W71-11778

PROBLEMS OF TELEPHONE COMMUNICATIONS IN TELEMETRY,
BIF, Providence, R.I.
James R. Daneker.
Journal of the American Water Works Association, Vol. 62, No. 11, p 729-731, November 1970.

Descriptors: *Telemetry, *Water quality control, *Monitoring, Effluents, Communication.

The amount of telemetered data that will be added to municipal water production and distribution systems in the next 10 years probably will exceed all that was gathered before. One cause of this is the necessity to control and police water sources which requires water quality monitoring both for the input to treatments and the effluents from them. The growth in this area will require the solution to many problems of telephone communications in telemetry. The area of greatest concern is that of proper data channel planning and selection. This paper discusses that area in general terms and suggests approaches to meeting these problems. The importance of long-range planning is emphasized. This includes bringing together personnel of the municipality, the telephone company, and the manufacturers. The importance of economic evaluations of terminal hardware and the communications network are discussed and the necessity for defining engineering decisions in language that will be meaningful to the ultimate user of the system is emphasized. (Mortland-Battelle)
W71-11826

CHART RECORDING AIDS POLLUTION CONTROL.
Instrument Practice, Vol. 24, No. 12, p 817-820, December 1970. 6 fig.

Descriptors: *Data collections, *Water temperature, *Dissolved oxygen, Charts, Water pollution control, Depth, Water pressure, Currents (Water), Fish migration, Instrumentation.
Identifiers: *Recorder.

A small portable chart recorder is used with the Submersible Temperature and Oxygen Recording Equipment (STORE) recently developed by the Water Pollution Research Laboratory in Stevenage, England. The equipment is designed for immersion to at least 15 feet for periods of a week or more to measure temperature and percentage of air saturation in isolated pond and river locations. Such records have also been used in fish migration studies to display amplified signals from fish fitted with sonic transmitters and in oceanography to record water temperature, depth, pressure, currents, and the state of charge in main batteries in deep-sea exploration vehicles. (Mortland-Battelle)
W71-11828

REVIEW OF DIGITAL THERMOMETERS.

Instruments and Control Systems, Vol. 43, No. 6, p 89-93, June 1970.

Descriptors: *Monitoring, *Instrumentation, *Thermometers, Temperature, Data collections.
Identifiers: Digital thermometers.

Data are included on operating ranges, accuracy, and other important parameters of digital thermometers available from various manufacturers. (Little-Battelle)
W71-11830

REVIEW OF INSTRUMENTATION TAPE RECORDERS.

Instruments and Control Systems, Vol. 43, No. 7, p 67-72, July 1970. 19 fig.

Descriptors: *Data storage and retrieval, Data collections, Electronic equipment.
Identifiers: *Tape recorders.

Operational parameters are given for a number of magnetic data recorders. These include recording speeds, frequency range, information density, S/N ratios, and other pertinent values. (Little-Battelle)
W71-11832

CONDUCTION ERROR IN TEMPERATURE SENSORS,
Rosemount Engineering Co., Minneapolis, Minn.
For primary bibliographic entry see Field 07A.
W71-11839

POLAROGRAPHIC OXYGEN ANALYZER RESPONSE: THE EFFECT OF INSTRUMENT LAG IN THE NON-STEADY STATE REAERATION TEST,
Washington Univ., Seattle. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05A.
W71-11846

INSTRUMENT CALIBRATION BY THE KNOWN-INCREMENT PRINCIPLE AND ITS APPLICATION TO A SODIUM ION ANALYZER,
Leeds and Northrup Co., North Wales, Pa.
E. L. Eckfeldt.
ISA Transactions, Vol 9, No 1, p 37-44, 1970. 5 fig, 3 tab, 5 ref.

Descriptors: *Instrumentation, *Calibrations, *Sodium, Electrodes.
Identifiers: *Sodium ion analyzer.

Because of the difficulty of calibrating non-linear instruments, a method called the known-increment principle was developed for this purpose. The calibration method, which involves mathematical analysis of results obtained from known and unknown sources, has been applied to sodium ion electrodes. Using this calibration technique, it was possible to measure sodium concentrations from 0.1 to 1.0 ppb. The technique also has the advantage of using ordinary sample water as the calibrating solution which can be prepared within the protected system of the analyzer thereby virtually eliminating the danger of contamination. Details of sample handling, mathematical analysis and other advantages of the method are included. (Little-Battelle)
W71-11901

EFFICIENCIES OF VARIOUS GRABS AND CORERS IN SAMPLING FRESHWATER BENTHOS,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
John F. Flannagan.
Journal of the Fisheries Research Board of Canada, Vol 17, No 10, p 1691-1700, October 1970. 4 fig, 3 tab, 9 ref.

Descriptors: *Sampling, *Benthos, *Sediments, *Core drilling, Lake Ontario, Gravels, Sands, Mud, Diptera, Oligochaetes.
Identifiers: Lake Winnipeg (Canada), Ponar grab, Shipek grab, Franklin-Anderson grab, Ekman grab, Sphaeriids, Alpine corer, Dietz-La Fond grab, FRB multiple corer.

Several grab and core samplers were compared by taking benthic samples from a variety of substrates in Lake Ontario and Lake Winnipeg. The samplers evaluated were the Franklin-Anderson grab, the Shipek grab, the Ponar grab, the Ekman standard and tall grab, the Benthos corer, the Alpine corer, the CCIW multiple corer, the FRB multiple corer and the Dietz-La Fond grab. In the first series of samples taken from soft mud, the Dietz-La Fond grab and the CCIW multiple corer failed to function. The Ponar and Shipek grabs which were the only samplers that functioned in gravel in Lake Ontario, came the closest to being all sediment samplers. However, these did not provide realistic samples of the benthos. Samples taken from profundal mud in Lake Winnipeg were compared with core samples taken by a diver. The Fisheries Research Board multiple corer and the standard Ekman grab gave quantitative results for macrobenthos. However, the multiple corer collected fewer chironomids and the Ekman grab fewer oligochaetes than were in the diver's sample. Other samplers sampled certain portions of the benthic community better than the multiple corer and the Ekman grab but their overall performance was not as good. Minor improvements in the Ekman sampler could make it more efficient. (Little-Battelle)
W71-11903

POTENTIOMETRIC STUDIES WITH A LIQUID ION-EXCHANGE LEAD-SELECTIVE ELECTRODE,
Kentucky Univ., Lexington. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W71-11908

VIRUS STUDIES ON THE WINDHOEK WASTEWATER RECLAMATION PLANT (SOUTHWEST AFRICA),
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 05A.
W71-11913

APPLICATION OF A HIGH SENSITIVITY TOTAL ORGANIC CARBON ANALYZER,
Beckman Instruments, Inc., Fullerton, Calif. Process Instruments Div.
For primary bibliographic entry see Field 05A.
W71-11945

ELECTROCHEMICAL METER FOR ACTIVITY MEASUREMENTS IN NATURAL ENVIRONMENTS,
California Univ., Berkeley. Inst. of Marine Resources and Engineering Geoscience.
For primary bibliographic entry see Field 02K.
W71-11953

INFRARED SCANNING TRACES POLLUTION.
For primary bibliographic entry see Field 05B.
W71-11962

OCCURRENCE OF NEMATODES IN BENTHIC DEPOSITS,
Illinois Univ., Urban. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05A.
W71-11974

MISSISSIPPI VALLEY MAPPING,
Geological Survey, Rolla, Mo. Topographic Div.
For primary bibliographic entry see Field 07C.
W71-11986

EARTH RESOURCES AIRCRAFT PROGRAM STATUS REVIEW--VOLUME 3. HYDROLOGY, OCEANOGRAPHY, AND SENSOR STUDIES.
National Aeronautics and Space Administration, Houston, Tex. Manned Spacecraft Center.

Available as N71-16166-186 from National Technical Information Service, Springfield, Va. 22151, for $6.00 paper copy, $0.95 in microfiche. Symposium Proceedings, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, September 16-18, 1968. 399 p.

Descriptors: *Remote sensing, *Instrumentation, *Hydrology, *Oceanography, Water resources, Hydrogeology, Glaciers, Infrared radiation, Reviews, Mapping, Radar, Aerial photography, Satellites (Artificial).
Identifiers: *NASA.

A review of various aspects of the Earth Resources Program was held at the Manned Spacecraft Center, Houston, Texas. Particular emphasis was placed on the results of analysis of data obtained by the Manned Spacecraft Center and by aircraft which have contributed data to the program. The review was divided into the disciplinary areas of Geology, Geography, Hydrology, Agriculture and Forestry, and Oceanography. An additional session was held on instrumentation. Volume 3 reviews Hydrology, Oceanography, and Sensor Studies. The review provides a current assessment of the program for both management and technical personnel. The material presented represented the current status on ongoing programs and consequently complete technical analyses. (See also W71-12000 thru W71-12017) (Knapp-USGS)
W71-11999

EVALUATION OF SOUTH CASCADE GLACIER TEST SITE RESULTS,
Geological Survey, Tacoma, Wash.
M. F. Meier.
In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 20-1 to 20-17, September 16-18, 1968. 17 p, 6 fig, 2 tab, 3 ref.

Descriptors: *Remote sensing, *Glaciers, *Snowpacks, *Satellites (Artificial), Infrared radiation, Radar, Ultraviolet radiation, Aerial photography, Instrumentation.
Identifiers: *South Cascade Glacier (Wash).

The South Cascade Glacier Test Site was picked for a study of remote sensing of glaciers because more instruments, measurements, knowledge, and data are available there than in any other high-mountain area with varied snow and ice types. This site has been the primary research area for the U. S. Geological Survey program in high-mountain and glacier hydrology and glacier-climate interactions since 1957. Another advantage of the South Cascade Glacier Test Site is that if offers, at certain times of the year, many conditions that are similar to those encountered in the Arctic and the Antarctic. The remote sensing tests include ultraviolet radiation, visible light, thermal infrared, passive microwave, and active microwave techniques. (See also W71-11999) (Knapp-USGS)
W71-12000

APPLICATION OF REMOTE SENSING TO OCCURRENCE OF COLLAPSE SINKHOLES IN THE ALAFIA AND PEACE RIVER BASINS, FLORIDA,
Geological Survey, Tampa, Fla.
A. E. Coker.
In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 22A-1 to 22A-14, September 16-18, 1968. 14 p, 7 fig, 10 ref.

Descriptors: *Land subsidence, *Karst, *Remote sensing, *Florida, *Aerial photography, Infrared radiation, Terrain analysis, Soil moisture, Water levels, Permeability, Instrumentation.
Identifiers: Polk County (Fla).

In the headwaters of the Alafia and Peace Rivers in Polk County, Florida, the topography is karst, and carbonate rocks underlying the area have undergone, and are presently undergoing, solution by water. This solution has caused active subsidence, and homes have been lost to sinkhole collapse. The area is presently undergoing emergence and reactivation of the karst cycle. Locally, caverns saturated with groundwater are slowly collapsing as the water table and piezometric surface gradually decline. Techniques are discussed by which sinkhole collapse may be anticipated by using remote sensing to identify, delineate, and study these relic features as they relate to sinkhole collapse. The general quality and resolution of the black and white, color, and color infrared (IR) positives are excellent, and overlap is sufficient to permit some

stereoviewing. The film has many features that contain information which may be transferred to the study of the sinkhole problem. In particular, patterns of sinkhole-type depressions are clearly definable, and some show characteristic zoning of vegetation and soil differences. Many details of the features recorded by the photography are not obvious on the ground. These details include shallow and nearly completely filled sinkhole depressions, false and radial drainage patterns, and vegetation zoning. Surface properties expressed by topography and soil properties such as mineralogy, textures, color, and moisture differences are identifiable. (See also W71-11999) (Knapp-USGS)
W71-12001

EFFECTS OF URBAN DEVELOPMENT ON THE HYDROLOGY OF LONG ISLAND, NEW YORK,
Geological Survey, Arlington, Va.
E. J. Pluhowski.
In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 21-1 to 21-9, September 16-18, 1968. 9 p, 4 fig.

Descriptors: *Remote sensing, *Urbanization, *Hydrogeology, *New York, *Water temperature, Waste water disposal, Surface waters, Groundwater, Hydrographs, Runoff, Floods, Peak discharge, Instrumentation.
Identifiers: *Long Island (N Y), *Urban hydrology.

Urbanization on Long Island has progressed from the densely populated western part of the island to the rural central and eastern parts. The effect of man's activities on the hydrology of Long Island has been most evident in the flood hydrographs of streams. The volume of flood runoff has increased severalfold in urbanized areas. Recharge to the groundwater reservoir has dwindled because of sewerage operations and the spread of paved area. Accordingly, there has been a lowering of groundwater levels in some urban areas. Less obvious, but nevertheless real, are the effects of man's activities on stream-temperature patterns. The principal objective of this paper is to demonstrate the use of infrared (IR) imagery to detect man-induced changes in the thermal patterns of water bodies and nearby land areas. (See also W71-11999) (Knapp-USGS)
W71-12002

USE OF REMOTE SENSORS IN CLASSIFYING LAKES IN WEST-CENTRAL FLORIDA,
Geological Survey, Tampa, Florida.
J. W. Stewart.
In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 22B-1 to 22B-11, September 16-18, 1968. 11 p, 5 fig, 1 ref.

Descriptors: *Land subsidence, *Karst, *Remote sensing, *Florida, *Aerial photography, Infrared radiation, Terrain analysis, Soil moisture, Water levels, Permeability, Instrumentation.

Investigation was undertaken to determine how to effectively apply remote sensors to problems of lake hydrology by defining the optimum parameters that can be used as a basis for (1) establishing a system of classification of lakes in a karst topography in Florida, which has transfer value to other areas of similar geologic, hydrologic, and climatologic condition; (2) developing a classification of the shoreline features of lakes as a means of establishing average high-water marks historically significant to the hydrology of an area; and (3) determining the interrelations between different classes of lakes and their occurrence and effects on the hydrologic regimen of an area. Color IR photography showed distinct and well-defined shoreline features of lakes in the flat coastal area in which land altitudes ranged from about 25 to 75 feet above msl. Relict features of old lake beds and recently dried-up lakes show as well-defined vegetative patterns. The heavily forested areas (chiefly cypress) adjacent to many lakes indicate a shallow water table that should generally be less than 5 feet below land surface and are areas which are subject to flooding durin g rainy seasons. These low wet areas are interpreted as being underlain by a silty-clayey soil having a low infiltration rate. (See also W71-11999) (Knapp-USGS)
W71-12003

REMOTE-SENSING APPLICATIONS TO HYDROBIOLOGY IN SOUTH FLORIDA,
Geological Survey, Miami, Fla., Water Resources Div.
Milton C. Kolipinski, and Aaron L. Higer.
In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 23-1 to 23-44, September 16-18, 1968. 44 p, 20 fig, 1 tab, 92 ref.

Descriptors: *Remote sensing, *Hydrogeology, *Limnology, *Infrared radiation, *Hydrology, Environment, Florida, Satellites (Artificial), Aerial photography, Photogrammetry, Instrumentation, Mapping, Surveys, Swamps, Wetlands, Saline water intrusion.
Identifiers: *Hydrobiology.

Results are presented of a study of the application of remote-sensing data as a tool in hydrobiological investigations in the Everglades and coastal regions of south Florida. Panchromatic, color, color infrared, and multiband photographs used individually and in combination show gross, as well as detailed, features that permit evaluation of water resources. Hydrologic features such as depth and size of basins and drainage patterns are easily measured or observed. The distribution of aquatic and semiaquatic plants serves as an indicator of hydrologic conditions. Examples are the occurrence of red and black mangrove trees along shorelines, which indicate the mean high-water level; also, the reflections from algal mats and emergent aquatic plants allow for the delineation of the fresh-water/brackish-water interface. These observations were made from orbital photography at altitudes to and greater than 150 miles. Multiband imagery shows potential in extracting the spectral signatures of willow and fig trees and cattail marshes. The findings have transfer value to other marsh, swamp, and coastal regions of the United States. (See also W71-11999) (Knapp-USGS)
W71-12004

ESTUARINE STUDIES,
Geological Survey, Philadelphia, Pa.
Richard W. Paulson.
In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 24-1 to 24-10, September 16-18, 1968. 10 p, 5 fig, 1 ref.

Descriptors: *Remote sensing, *Estuaries, *Aerial photography, *Delaware, Infrared radiation, Satellites (Artificial), Photogrammetry, Water pollution, Thermal pollution, Water quality, Path of pollutants, Surveys, Data collections, Delaware River, Instrumentation.
Identifiers: *Delaware Estuary.

The objective of the U. S. Geological Survey estuarine remote-sensing program is to determine the feasibility of using remote sensors for studying estuaries from aircraft or spacecraft platforms. The particular objectives of the Delaware Estuary Program are to determine whether variations in water quality, which are known to exist in this highly polluted water body, can be detected remotely and to devise methods for using remote-sensing data to solve estuarine problems. Preliminary remote-sensing data of the Delaware Estuary indicate that thermal variations of as small as 1 deg C and spatial variations of as small as 100 feet exist and can be detected by aircraft-mounted IR scanners and aerial cameras. Thermal effluents from electric-power generating plants, may have spatial dimensions of one-half mile and thermal contrasts of up to 10 deg C. In addition, the general circulation of some estuaries and bays could be monitored from space during some seasons of the year when thermal or color contrasts are present. (See also W71-11999) (Knapp-USGS)
W71-12005

USE OF INFRARED IMAGERY TO LOCATE SURFICIAL AQUIFERS, DELMARVA PENINSULA, MARYLAND AND DELAWARE,
Geological Survey, Towson, Md.
Este F. Hollyday.
In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 25-1 to 25-14, September 16-18, 1968. 14 p, 8 fig, 4 ref.

Descriptors: *Remote sensing, *Groundwater, *Aquifers, *Delaware, Surveys, Sands, Water temperature, Infrared radiation, Water resources development, Groundwater movement, Discharge (Water), Aerial photography, Instrumentation.
Identifiers: *Infrared imagery, Delmarva Peninsula.

Infrared imagery was tested as a rapid reconnaissance technique for locating the thickest sections of water-bearing surficial sand on the Delmarva Peninsula. Relative temperature of visible water was recorded along a control line on which the hydrogeology had been studied in detail, and along six test lines. The location of the three strongest and most diffuse thermal anomalies seemed to be controlled by areas of thick surficial sands, short reaches of major streams almost immediately above the head of estuaries, and absence of fine-grained marine sediments overlying the surficial sand aquifers. Infrared imagery can be used to locate thick surficial sand aquifers only where all the hydrogeologic constraints are satisfied. Infrared imagery can be used also to locate some of the major modes on the discharge boundary of regional groundwater flow systems. (See also W71-11999) (Knapp-USGS)
W71-12006

REMOTE SENSING OF MARSHLANDS AND ESTUARIES USING COLOR INFRARED PHOTOGRAPHY,
Geological Survey, Washington, D.C.
Richard R. Anderson.
In: Symposium on Earch Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 26-1 to 26-23, September 16-18, 1968. 23 p, 11 fig, 1 tab, 6 ref.

Descriptors: *Remote sensing, *Aerial photography, *Infrared radiation, *Maryland, Marshes, Estuaries, Water temperature, Aquatic plants, Water quality, Currents (Water), Instrumentation.
Identifiers: *Patuxent River (Md).

Remote-sensing techniques, particularly color infrared photography, show promise as valuable tools in studies of estuaries and marshes. Color infrared film and various Wratten filters (15-G, 25-A, 61, 89-B) were used in estuarine and marshland studies of the Patuxent River, Maryland. Color infrared film, with use of various filters, provides information on various water-quality parameters and vegetation composition not obtainable using other remote-sensing methods. The Wratten 15-G filter appears to be the most useful, but the Wratten 25-A filter may be superior in delineation of submerged aquatic plants. The Wratten 61 and 89-B filters provide a tool for specific plant type, distribution in marshes, and shoreline delineation. (See also W71-11999) (Knapp-USGS)
W71-12007

APPLICATION OF RADAR IMAGERY TO DRAINAGE ANALYSIS,
Illinois Univ., Chicago.
Roger M. McCoy.

In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 27-1 to 27-18, September 16-18, 1968. 18 p, 12 fig, 1 ref.

Descriptors: *Remote sensing, *Radar, *Topography, *Geomorphology, *Terrain analysis, Drainage patterns (Geologic), Mapping, Data collections, Surface waters, Hydrologic data, Instrumentation.
Identifiers: *Side-looking radar.

Radar imagery is examined for possible applications to many geoscience studies. The fields of geomorphology and hydrology benefit greatly from the use of radar imagery for measurement of terrain parameters. Radar imagery offers several advantages for geomorphic studies. Side-looking imaging radars obtain greater ground coverage than vertical mapping cameras carried at the same altitude. This characteristic permits a broad regional view on one image. A second important advantage is that radar imagery presents a large quantity of geomorphic detail relative to its scale. Most radar systems show more stream detail than a topographic map of the same scale. A third advantage for terrain studies is a consistent relationship between the quantitative data derived from radar and data derived from large-scale topographic maps (1:24 000). Thus, by applying a conversion factor to terrain features measured on radar images, it is possible to project data to a topographic map (1:24 000) equivalent. (See also W71-11999) (Knapp-USGS)
W71-12008

RADAR SEA RETURN AS A FUNCTION OF WAVE HEIGHT AND WIND SPEED FOR FULLY DEVELOPED SEAS,
New York Univ., Bronx. Dept. of Meteorology and Oceanography.
Willard J. Pierson, Jr.
In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 42-1 to 42-27, September 16-18, 1968. 27 p, 6 fig, 12 tab, 2 ref.

Descriptors: *Remote sensing, *Radar, *Waves (Water), *Satellites (Artificial), *Aircraft, Wavelengths, Instrumentation, Winds, Velocity, Meteorological data, Calibrations.
Identifiers: *Wave height.

A total of 916 individual measurements were made of the radar scattering cross section versus the beam angle for various wave heights in fully developed seas. Increasing wind speed and wave height results in increasing values of cross section for all angles of incidence between 15 deg and 55 deg. The increases are 19 decibels at 30 deg and 22 decibels at 45 deg as the wind increases from 12 to 38 knots. There is no evidence of any saturation effect. The radar return is higher for upwind-downwind conditions than for crosswind conditions. When simple fully developed seas are present, the difference can be detected at 18, 28, and 38 knots. The scatter of the observations is the result of statistical effects and mesoscale variability in the waves and winds. Most of the time, the scatter is within 2 decibels. The extreme scatter was 4 decibels. One measurement from an aircraft can provide an estimate of the wind speed within 3 knots two-thirds of the time. Spacecraft data should yield substantially more accurate values. (See also W71-11999) (Knapp-USGS)
W71-12009

SEA-STATE MEASUREMENTS WITH A RADAR PROFILOMETER,
Naval Oceanographic Office, Washington, D.C.
Lionel I. Moskowitz.
In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 43-1 to 43-6, September 16-18, 1968. 6 p, 4 fig.

Descriptors: *Remote sensing, *Radar, *Waves (Water), *Satellites (Artificial), *Aircraft, Wavelengths, Instrumentation, Winds, Velocity, Meteorological data, Calibrations.
Identifiers: *Wave height.

High sea states were determined by radar scatterometry. The aircraft used in the study has three major environmental systems aboard. These major systems can provide data pertaining to ocean wave heights, sea surface temperature, and temperature as a function of water depth. A continuous record of wave heights is obtained from an altitude of approximately 500 feet. The profiler is an FM-cw radar operating at a frequency of 4.3 gigahertz with frequency modulation of 25 megahertz. From a 500-foot altitude, a 15-foot spot is illuminated on the ocean surface. This limits the wave information to wavelengths greater than 30 feet (or wave periods greater than 3 seconds). Vertical motion of the aircraft is removed by a coupled accelerometer. For the most part, all the scatterometer data obtained were for seas approximately at the fully developed state. (See also W71-11999) (Knapp-USGS)
W71-12010

RADAR SCATTEROMETER MEASUREMENTS OF SEA ICE,
Kansas Univ., Lawrence. Remote Sensing Lab.
J. W. Rouse, Jr.
In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 44-1 to 44-29, September 16-18, 1968. 29 p, 16 fig, 1 tab, 6 ref.

Descriptors: *Remote sensing, *Radar, *Sea ice, *Aircraft, Mapping, Surveys, Ice, Icebergs, Topography, Sea water, Instrumentation.
Identifiers: *Radar scatterometry.

The use of radar was studied as a sensor for identification of arctic ice types. The radar data were recorded by a 13.3-gigahertz radar scatterometer. This continuous wave Doppler instrument measures the scattering coefficient of individual resolution cells over the range of incidence angles from 60 deg ahead to 60 deg aft of the aircraft. The fact that the data are related to individual cells (approximately 100 feet square) along the flight path and that the ice type was known for each cell resulted in 'signatures' of the ice types. These signatures, in the form of scattering-coefficient curves versus incidence-angle curves, are sufficiently unique that ice-type discrimination was possible. Each flight line is documented with aerial photography and continuous narration by a Navy aerographic observer. In addition, one line included ground truth. The analysis includes comparison of radar return amplitude as a function of time with the air photomosaic of the flight line; comparison of scattering-coefficient curves for various ice types; and an estimation of the surface statistics obtained by fitting the data to the backscatter theory based on the Kirchhoff-Huygens Principle. (See also W71-11999) (Knapp-USGS)
W71-12011

COMPARISON OF MICROWAVE RADIOMETRY OF THE OCEAN DURING HURRICANE BEULAH (MISSION 57) WITH SIMULATED OCEAN SURFACE MEASUREMENTS,
Miami Univ., Coral Gables, Fla.
G. F. Williams, Jr.
In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 45-1 to 45-8, September 16-18, 1968. 8 p, 3 fig, 6 ref.

Descriptors: *Remote sensing, *Calibrations, *Microwaves, *Electromagnetic waves, Instrumentation, Aircraft, Albedo, Waves (Water), Hurricanes.
Identifiers: *Microwave radiometry.

In order to provide a general guide in the interpretation of airborne microwave radiometer data over the ocean, measurements were made of a simulated ocean surface. A system of radiometers on the frequencies of 9.4, 15.8, 22.2, and 3[illegible] gigahertz was installed in the NASA aircraft. The simulation experiment was conducted with the aircraft parked and a temporary test tank 8 feet in diameter erected below the radome housing the radiometers. The water surface was disturbed by a water spray to simulate the impact of rain. Then, 1 ounce of detergent was added, and a high-pressure jet generated 1/4 to 1/2 inch of foam, simulating the effects of sea foam and whitecaps, and the measurements were repeated. The blanket of foam produced a large increase of about 100 deg K in apparent temperature, apparently changing the emissivity of the water from approximately 0.40 to a value near 1.0. These measurements were compared with measurements made in Hurricane Beulah, 1967. The results at 9.4 gigahertz, with certain qualifications regarding calibration, are in definite agreement with the predicted temperature/wind velocity/foam cover relationship. However, unless apparent sky temperatures are measured concurrently, there is a large unknown factor in measurements of the ocean. (See also W71-11999) (Knapp-USGS)
W71-12012

OCEAN BOTTOM SURVEYING WITH AERIAL PHOTOGRAPHY,
Massachusetts Inst. of Tech., Cambridge. Experimental Astronomy Lab.; and Naval Oceanographic Office, Washington, D.C.
A. C. Conrod, and H. A. Short.
In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 46A-1 to 46A-17, September 16-18, 1968. 17 p, 10 fig.

Descriptors: *Aerial photography, *Remote sensing, *Bottom sediments, Surveys, Beaches, Suspended load, Water quality, Satellites (Artificial), Data collections, Terrain analysis, Instrumentation.
Identifiers: *Ocean bottom surveys.

Studies of the application of aerial photography and spectrography to ocean surveying show that good bottom detail may be obtained at depths ranging in some cases to more than 25 meters, and biological and geological features can be seen and interpreted. The method shows promise as a survey tool for examining the near-shore environment and in studying land-sea interactions, both natural and artificial. The kinds and amounts of suspended and dissolved water may be estimated with airborne radiometers. The uses of photography are compared with electro-optical imaging systems for possible operational use on ERSP and EROS satellites. Some of the design and application aspects of nonphotographic imaging systems are discussed. (See also W71-11999) (Knapp-USGS)
W71-12013

SURFACE EFFECTS AND SUBMERGED FEATURES,
Michigan Univ., Ann Arbor.
F. C. Polcyn.
In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 46B-1 to 46B-18, September 16-18, 1968. 18 p, 14 fig, 1 ref.

Descriptors: *Remote sensing, *Oceanography, Waves (Water), Water quality, Water temperature, Color, Radar, Aircraft, Instrumentation.
Identifiers: *Oceanology.

Remote sensors to be used to determine location and measurement of submerged oceanographic features measure color and thermal anomalies, wave infraction effects, and time differences of reflected laser pulses. These aspects for the

identification and location of a particular depth of water (100 feet or less) are renewed. The various sensor types that could be employed are discussed. (See also W71-11999) (Knapp-USGS)
W71-12014

RESULTS OF REMOTE-SENSING TESTS FOR OCEANOGRAPHY AT TEXAS A AND M UNIVERSITY,
Texas A and M Univ., College Station. Dept. of Oceanography.
Jack F. Paris.
In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 49-1 to 49-51, September 16-18, 1968. 51 p, 36 fig, 3 tab, 10 ref.

Descriptors: *Remote sensing, *Oceanography, Infrared radiation, Aerial photography, Microwaves, Surveys, Mapping, Water temperature, Meteorological data, Mixing, Waves (Water), Deltas, Mississippi River, Instrumentation.
Identifiers: *Mississippi Delta.

Airborne tests of multispectral remote sensors were conducted on eight occasions between July 1966 to September 1968 over the Mississippi Delta area and eastern Gulf of Mexico to determine the usefulness of the sensors in surveying river, coastal, and deep-sea phenomena. Four of these tests were supported concurrently by oceanographic research vessels. Passive remote sensors -- principally metric cameras, infrared imagers, and microwave radiometers were flown at 1500, 5000, 10,000, and 50,000 feet above sea level. The following features of the Mississippi River were surveyable by remote sensors: (1) location of surface frontal zones of convergence; (2) determination of surface water mass type; (3) small-scale pattern of mixing; (4) location of internal waves; and (5) general outflow pattern shape and extent. (See also W71-11999) (Knapp-USGS)
W71-12015

RADAR PROGRESS IN THE NASA EARTH RESOURCES AIRCRAFT PROGRAM,
Kansas Univ., Lawrence. Center for Research in Engineering Science.
R. K. Moore.
In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 50-1 to 50-51, September 16-18, 1968. 51 p, 28 fig, 27 ref.

Descriptors: *Radar, *Remote sensing, *Aircraft, Mapping, Surveys, Satellites (Artificial), Microwaves, Data processing, Data collections, Reviews, Instrumentation.
Identifiers: *Radar scatterometry.

The NASA Earth Resources Aircraft Program has led to expansion in knowledge of geoscience-resource applications of radar. Aircraft are being equipped with a radar imager and multifrequency/polarization scatterometers. Multifrequency imaging radar, preferably 'polypanchromatic,' should give even more important results. The progress in multiimage data processing shows great potential of both semi-real-time and general-purpose computer techniques. (See also W71-11999) (Knapp-USGS)
W71-12016

INFRARED STUDIES,
Michigan Univ., Ann Arbor.
D. S. Lowe.
In: Symposium on Earth Resources Aircraft Program, National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Texas, p 51-1 to 51-17, September 16-18, 1968. 17 p, 11 fig, 1 tab.

Descriptors: *Remote sensing, *Infrared, *Instrumentation, Surveys, Mapping, Calibrations, Aircraft, Reviews, Data collections, Satellites (Artificial).
Identifiers: Infrared scanning.

The NASA Remote Sensing Aircraft Program uses infrared (IR) scanners for thermal mapping and multispectral sensing. The scanners can operate in any region of the optical spectrum. The electrical signal can be readily transmitted, recorded, analyzed, or processed as needed or desired. The detectors generally have a very large dynamic range, and the detection process is reversible. (That is, unlike photographic film the detectors are reusable.) The sensor is amenable to calibration and can yield quantitative data. Collection of data simultaneously in many wavelength channels is possible. (See also W71-11999) (Knapp-USGS)
W71-12017

ICE STUDIES (Ledovyye issledovaniya).
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W71-12021

HYDROBIOLOGY, 'BIORESOURCES OF SHALLOW WATER ENVIRONMENTS'.

Weist, W.M., Jr., and Greeson, P.E., ed., Proceedings of Symposium, Miami Beach, Florida, June 24-27, 1970; American Water Resources Association, Urbana, Illinois, Proceedings Series No 8, 1970. 385 p.

Descriptors: *Water pollution sources, *Ecosystems, *Ecology, *Water resources development, *Surface waters, Remote sensing, Water quality, Water balance, Eutrophication, Analytical techniques, Aerial photography.
Identifiers: *Hydrobiological investigations.

This volume contains 33 papers concerning the following topics: (1) Harvesting the Hydrosphere, (2) Conservation and Development of Bioresources, (3) Fresh-Water Bioresources, (4) Marine Bioresources, (5) Remote Sensing of Bioresources, and (6) New Methodology in Hydrobiological Studies. (See also W71-12030 thru W71-12035) (Woodard-USGS)
W71-12029

THE USE OF AERIAL PHOTOGRAPHY FOR HYDROBIOLOGICAL INVESTIGATIONS,
Eastman Kodak Co., Rochester, N.Y. Research Labs.
Norman L. Fritz.
In: Hydrobiology, 'Bioresources of Shallow Water Environments', Proceedings of Symposium, Miami Beach, Florida, June 24-27, 1970; American Water Resources Association, Urbana, Illinois, Proceedings Series' No 8, p 255-261, 1970. 7 p, 1 ref.

Descriptors: *Aerial photography, *Remote sensing, *Surface waters, *Ecosystems, *Biological communities, Analytical techniques, Photometry, Water pollution.
Identifiers: *Hydrobiological investigations.

The characteristics, uses, and limitations of aerial photography are presented in the hope that hydrobiologists can use the information for their applications. A brief summary of many of the factors that affect aerial photography and its interpretation is included. Many of these factors are interdependent, and to obtain the optimum in information from a photographic system, a systems approach might be used in the selection of its individual elements. Many choices can be made between the various parameters, and the proper selection of each parameter can help maximize the usefulness of such photography. Most of the concepts are easily mastered, and a knowledge of them, or a realization that they exist and that help can be obtained in a system design, will assist in deriving techniques that will provide maximum information in the resulting photography. (See also W71-12029) (Woodard-USGS)
W71-12031

INFRARED AND MULTISPECTRAL SENSING IN HYDROBIOLOGICAL APPLICATIONS,
Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
D. S. Lowe.
In: Hydrobiology, 'Bioresources of Shallow Water Environments,' Proceedings of Symposium, Miami Beach, Florida, June 24-27, 1970; American Water Resources Association, Urbana, Illinois, Proceedings Series No 8, p 262-273, 1970. 12 p, 10 fig, 17 ref.

Descriptors: *Aerial photography, *Infrared radiation, *Remote sensing, *Surface waters, *Ecosystems, Analytical techniques, Photography, Water pollution.
Identifiers: *Hydrobiological investigations, *Infrared photography.

Optical-mechanical scanners can be used in hydrobiological investigations to generate imagery significantly different from that produced by cameras. Infrared imagery contains information directly related to surface temperature of features. Multispectral scanners and data processors analyze the spectral characteristics of each element in a scene and can identify areas of similar spectral characteristics. In some applications, terrain features have been successfully classified on the basis of their spectral properties. Such automated classification is ideally suited for large area coverage. (See also W71-12029) (Woodard-USGS)
W71-12032

REMOTE SENSING OF COASTAL ENVIRONMENTS USING MULTISPECTRAL PHOTOGRAPHIC TECHNIQUES,
Long Island Univ., Greenvale, N.Y.
Edward Yost, and Sondra Wenderoth.
In: Hydrobiology, 'Bioresources of Shallow Water Environments,' Proceedings of Symposium, Miami Beach, Florida, June 24-27, 1970; American Water Resources Association, Urbana, Illinois, Proceedings Series No 8, p 274-302, 1970. 29 p, 26 fig, 8 ref.

Descriptors: *Aerial photography, *Remote sensing, *Ecosystems, *Surface waters, *Sediments, Vegetation, Photometry, Analytical techniques, Coasts, Shores, Cameras, Water pollution.

The usefulness of multispectral color aerial photography for accurately and repeatably measuring basic environmental parameters is demonstrated in a series of controlled experiments. The ability to establish image chromaticity differences for plants and trees under different solar illumination and atmospheric conditions is particularly significant. When coupled with spectroradiometric and biochemical analyses of coastal water masses, the ability of this technology to detect phytoplankton concentrations and sediments is promising. (See also W71-12029) (Woodard-USGS)
W71-12033

COLOR INFRARED PHOTOGRAPHY FROM 60,000 FEET ALTITUDE AS A TOOL FOR DELINEATING AQUATIC VEGETATION,
National Aeronautics and Space Administration, Houston, Tex. Manned Spacecraft Center.
For primary bibliographic entry see Field 05B.
W71-12034

MULTISPECTRAL STUDIES OF VEGETATION AND HYDROLOGIC CONDITIONS IN SOUTH FLORIDA,
Michigan Univ., Ann Arbor.
Norma S. Thomson.
In: Hydrobiology, 'Bioresources of Shallow Water Environments,' Proceedings of Symposium, Miami Beach, Florida, June 24-27, 1970; American Water Resources Association, Urbana, Illinois, Proceedings Series No 8, p 329-349, 1970. 21 p, 5 fig, 2 tab, 6 ref.

Descriptors: *Remote sensing, *Water resources development, *Aerial photography, *Vegetation, *Florida, Surface waters, Swamps, Photometry, Analytical techniques, Infrared radiation.
Identifiers: *Everglades National Park.

A cooperative research effort between the Water Resources Division of the U.S. Geological Survey and the Willow Run Laboratories of The University of Michigan was conducted with remote-sensing techniques to provide information concerning particular hydrologic conditions and to provide maps of the distribution of selected hydrobiological features in the Everglades National Park, Florida. Two scanners were employed to collect data in 18 separate narrow spectral bands extending from the ultraviolet (0.32 micrometers) to the thermal infrared (14 micrometers). The optical mechanical scanners were mounted in a C-47 aircraft. A rotating mirror scanned the ground in a direction perpendicular to the flight direction. This scanning action, in conjunction with the forward movement of the aircraft, covered a strip of terrain centered under the aircraft with a continuous set of scan lines. The 2,000-feet multispectral data collected over the Shark River Slough were processed using the weighted Euclidean Distance Decision rule. Theoretical discussions of this rule, also called the miss-distance or spectrum-matching technique are presented. (See also W71-12029) (Woodard-USGS)
W71-12035

A FIELD METHOD FOR DETERMINATION OF ANION-ACTIVE SURFACTANTS IN WATER,
Institute of General and Municipal Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 02K.
W71-12044

CHEMICAL TECHNIQUES FOR DISCHARGE MEASUREMENTS OF SMALL FLOWS: AGUAS RIVER, ALMERIA, SPAIN (Aforos Quimicos De Pequenos Caudales: Rio Aguas (Almeria)),
Centro de Edafologia y Biologia Aplicada del Segura, Murcia (Spain).
For primary bibliographic entry see Field 02E.
W71-12120

APOLLO 9 EYES WATER MANAGEMENT.
High Plains Underground Water Conservation District No 1, Lubbock, Tex.

Cross Section, Vol 16, No 10, October 1970, p 1, 3-4.2 fig.

Descriptors: *Remote sensing, *Water management (Applied), *Irrigation practices, *Riparian rights, *Legal aspects, *Water rights, Aerial photography, Irrigated land, Water law, Groundwater basins, Aquifers, Public rights, Water resources development, Water policy, New Mexico, Texas.
Identifiers: *Apollo 9, *Ogallala Aquifer, *High Plains.

An Apollo 9 aerial photograph (AS9-26A-3807A) was taken on March 12, 1969 at 10:30 a.m. Central Standard Time from 137 miles, of a 10,000 square mile area showing agricultural development on the Texas-New Mexico State line in the High Plains. Cultivated areas are square or rectangular patches, either preplanted, irrigated or with a winter crop cover. Soils are similar, and the Ogallala Aquifer predominates. The New Mexico part of the photograph is sparsely irrigated, while the Texas part is mostly irrigated. Agriculture in Texas is more developed than in New Mexico because Texas law grants the landowner ownership of groundwater, and thus encourages groundwater basin management by local farmers. New Mexico law established that groundwater is state property. The agricultural situation for 2020 is questioned. Two photographs are presented. (Popkin-Arizona)
W71-12126

APOLLO 9 EYES AGRICULTURE.
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.

Cross Section, Vol 16, No 11, November 1970, p 4.

Descriptors: *Remote sensing, *Aerial photography, *Agriculture, *Topography, *Hydrogeology, *Water supply, Altitude, Texas, Reservoirs, Irrigation water, Grains (Crops), Sorghum.
Identifiers: *Apollo 9, *High Plains (Tex), *Ogallala Formation, White River Lake.

An Apollo 9 photograph (AS 9-26A-3808A), taken at an altitude of 137 miles, is presented showing a 10,000 square mile area in west Texas. The photograph reveals the termination of the High Plains agriculture on the eastern escarpment of the Ogallala Formation, topographic and geohydrologic conditions in this semi-arid region. A relatively large west Texas surface reservoir (White River Lake), containing 38,850 acre-feet, is dwarfed by the magnitude of the Ogallala aquifer which is the main water supply for the High Plains. The irrigation capacity of White River Lake is about 26,000 acres of grain sorghum, or about 0.4 percent of the photographed area, emphasizing the importance of the Ogallala to the Plains. Two figures show the Apollo photograph and a location map. (Popkin-Arizona)
W71-12142

7C. Evaluation, Processing and Publication

THE PRINCIPLE AND OPERATION OF FISH CATCH AND POLLUTION INFORMATION SYSTEM,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
P. J. Lee.
Technical Report No 250 (manuscript), 1971. 105 p, 26 append.

Descriptors: *Data collections, *Data processing, *Data storage and retrieval, Automation, Documentation, Information retrieval, Computer models, Fisheries, Fishing.
Identifiers: *Catch statistics, *Fish catch, Data standardization, Standardization of data.

Electronic data processing on a general fish catch system enables fishery biologists to utilize the large resource of data currently and potentially available to them. This study reviewed the existing status of the utilization of fish catch data in order to set the general fish catch record system. Specific formats are recommended, and the system's applicability to pollution records is discussed. The general system is conveniently used for information retrieval as well as for statistical analysis. (LeGore-Washington)
W71-11660

A TREATMENT OF COMPLEX IONS IN SEA WATER,
Illinois Univ., Urbana. Dept. of Physiology and Biophysics.
For primary bibliographic entry see Field 02K.
W71-11733

U.S. GEOLOGICAL SURVEY TRACER STUDY, AMARGOSA DESERT, NYE COUNTY, NEVADA--PART 2: AN ANALYSIS OF THE FLOW FIELD OF A DISCHARGING-RECHARGING PAIR OF WELLS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 04B.
W71-11755

FLOODS IN THE GUAYANILLA-YAUCO AREA, PUERTO RICO,
Geological Survey, Washington, D.C.
Fred K. Fields.
For sale by U.S. Geological Survey, Washington D.C. 20242 - Price $1.00. Geological Survey Hydrologic Investigations Atlas HA-414, 1 sheet, 1971. Text, 10 fig, 1 map.

Descriptors: *Floods, *Flood damage, *Flood plains, *Peak discharge, *Puerto Rico, Regional flood, Flood forecasting, Flood control, Stream flow, Stream gages, Flow characteristics, Hydrologic data, Data collections, Rainfall-runoff relationships, Hydrographs, Maps.
Identifiers: Illustrations, Flood frequencies, Flood profiles.

Floods in the Guayanilla-Yauco area, Puerto Rico are described on a one-sheet hydrologic atlas to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights, and other technical data. The flood of August 8, 1899, with a peak discharge of 39,000 cfs, is the greatest known flood. Other major floods occurred in 1928 (23,000 cfs), 1932 (28,000 cfs), and 1954 (18,000 cfs). A service road recently has been constructed across the lower flood plain of Rio Yauco. This and other changes along the channel and in the flood plain may well affect the inundation pattern of future floods. (Woodard-USGS)
W71-11772

FLOODS ON ROCK RIVER IN NORTHEASTERN JEFFERSON COUNTY, WISCONSIN,
Geological Survey, Washington, D.C.
James O. Shearman and Barry K. Holmstrom.
For sale by U.S. Geological Survey, Washington, D.C. 20242 - Price $1.00. Geological Survey Hydrologic Investigation Atlas HA-394, 1 sheet, 1971. Text, 6 fig, 1 map, 7 ref.

Descriptors: *Floods, *Flood damage, *Flood plains, *Peak discharge, *Wisconsin, Regional flood, Flood forecasting, Flood control, Streamflow, Stream gages, Rainfall-runoff relationships, Flow characteristics, Hydrologic data, Data collections, Hydrographs, Maps.
Identifiers: Standard project flood, Intermediate regional flood, Illustrations.

Flooding along Rock River in Northeastern Jefferson County, Wisconsin is described on a one-sheet hydrologic atlas to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles,s cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The 5-year flood at Afton has a peak discharge of 9,700 cfs. In a 9-year period, 1915-23, this flow was equaled or exceeded four times. In a 10-year period, 1930-39, the annual flood peaks did not reach this magnitude. However, for the 53-year period of records, 1914-66, the 5-year flood has been equaled or exceeded 10 times. (Woodard-USGS)
W71-11773

FOURIER ANALYSIS OF WEATHER AND WAVE DATA FROM HOLLAND, MICHIGAN, JULY 1970,
Williams Coll., Williamstown, Mass.; and Western Michigan Univ., Kalamazoo.
For primary bibliographic entry see Field 02H.
W71-11775

HYDROGEOLOGIC DATA FROM GOVE, LOGAN, AND WALLACE COUNTIES, KANSAS,
Kansas Geological Survey, Lawrence; and Geological Survey, Colby, Kans.
Katherine M. Keene, and Marilyn E. Pabst.
Kansas Ground Water Basic-Data Release No 2, 1971. 76 p, 1 fig, 1 plate, 5 tab.

Descriptors: *Groundwater, *Hydrologic data, *Data collections, *Water wells, *Kansas, Aquifers, Aquifer characteristics, Water levels, Water quality, Withdrawal, Drawdown, Pumping, Water supply, Water users, Chemical analysis, Water table, Water yield, Irrigation wells, Observation wells.
Identifiers: *Groundwater basic data (Kansas).

Records of 691 wells in Gove, Logan, and Wallace Counties, Kansas, are presented. Included are 629 irrigation, 24 domestic or stock, 24 public supply, 8 observation, and 6 unused wells. Several irrigation, domestic, and stock wells are used also as observation wells. Fifty-eight selected observation-well records show the seasonal fluctuations of the water table for periods of as much as 23 years. Chemical analyses of water from 56 representative wells are listed. Lithologic logs of 305 test holes, wells, and seismograph shotholes also are included. The amount of groundwater withdrawal has increased concurrently with the number of wells in use. The number of irrigation wells in Gove County increased from 43 to 193 during 1956-70, the number in Logan County increased from 13 to 101 during 1955-70, and the number in Wallace County increased from 96 to 335 during 1960-70. (Woodard-USGS)
W71-11783

CHEMICAL QUALITY OF WATER IN SOUTHEASTERN WYOMING.
Geological Survey, Cheyenne, Wyo.

Geological Survey Basic Data Report, 1971. 67 p, 1 fig, 5 tab, 45 ref.

Descriptors: *Water quality, *Data collections, *Wyoming, Sampling, Water analysis, Solutes, Calcium, Magnesium, Sodium, Potassium, Sulfides, Chlorides, Fluorides, Nitrates, Carbonates, Bicarbonates, Trace elements, Water temperature, Hydrogen ion concentration.
Identifiers: *North Platte River Basin (Wyo).

As a guide for water users, the U. S. Geological Survey, in cooperation with the Wyoming Natural Resource Board (now Department of Economic Planning and Development), compiled in this report chemical analyses, dating from 1895 to 1966, of surface and groundwaters for southeastern Wyoming. The area consists of approximately 24,000 square miles and includes the drainage basins of the North Platte, South Platte, and Niobrara Rivers in Wyoming. Most of the area is in the North Platte River basins. The source of each analysis is shown in the tables of analyses. The substances determined by analytical methods and expressed as ions are the cations calcium, magnesium, sodium, and potassium, and the anions are sulfate, chloride, fluoride, nitrate, and those contributing to alkalinity, which are usually expressed in terms of an equivalent amount of carbonate and bicarbonate. Other substances determined, but not as routinely, are boron, chromium iron, manganese, phosphate, silica, and selenium. Other properties given in the analyses in this report are color, concentration of hydrogen ions, dissolved solids, hardness expressed in terms of equivalent quantities of calcium-bicarbonate, percent sodium, sodium-adsorption ratio, and specific conductance. (Knapp-USGS)
W71-11784

NUMERICAL DIFFERENTIATION BY SPLINE FUNCTIONS AND ITS APPLICATION TO ANALYZING A LAKE TEMPERATURE OBSERVATION,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02H.
W71-11787

COSTING THE SYSTEM DESIGN ALTERNATIVES,
Department of the Navy, Washington, D.C. ADPE Selection Office.
For primary bibliographic entry see Field 06C.
W71-11821

MASS SPECTRUM DATA ACQUISITION SYSTEM.

Instrument Practice, Vol. 24, No. 8, p 561-562, August 1970. 2 fig, 1 tab.

Descriptors: *Automation, *Spectrometers, *Data processing, Data collections, Electronic equipment.

A mass spectrum data acquisition system which provides digitized data has been developed by the National Research Development Corporation of Teddington, England. The system is capable of resolving peaks 16 microseconds apart in time and can specify peaks with widths of 20 microseconds to 200ms. The system can also store up to 256 measurements of mass and intensity. Output from the system can be in the form of either paper or magnetic tape and is ready for computer processing on-line or off-line. (Little-Battelle)
W71-11829

STATISTICS AND EXPERIMENTAL DESIGN,
Sussex Univ., Brington (England). Mathematics Div.
For primary bibliographic entry see Field 07A.
W71-11842

INTERACTIVE MODELING OF A SMALL ARIDLAND WATERSHED ON A HYBRID COMPUTER,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 02E.
W71-11858

ECONOMICS OF WASTEWATER COLLECTION NETWORKS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W71-11861

MATHEMATICAL MODEL OF THE COLUMBIA RIVER FROM THE PACIFIC OCEAN TO BONNEBILLE DAM, PART I: THEORY, PROGRAM NOTES, AND PROGRAMS,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05B.
W71-11867

MATHEMATICAL MODEL OF THE COLUMBIA RIVER FROM THE PACFIC OCEAN TO BONNEVILLE DAM, PART II: INPUT-OUTPUT AND INITIAL VERIFICATION PROCEDURES,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05B.
W71-11868

SPATIAL HETEROGENEITY OF PHYTOPLANKTON IN A NEAR-SHORE ENVIRONMENT,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 05A.
W71-11889

FREQUENCY DISTRIBUTIONS OF THE CHEMICAL AND PHYSICAL CHARACTERISTICS OF POTABLE WATER,
Reading Univ., Whiteknights, Dept. of Applied Physical Sciences Reading Univ. (England). Dept. of Applied Physical Sciences.
For primary bibliographic entry see Field 05F.
W71-11911

MISSISSIPPI VALLEY MAPPING,
Geological Survey, Rolla, Mo. Topographic Div.
L. B. Robison.
ASCE Proceedings, Journal of the Surveying and Mapping Division, Vol 97, No SU-1, Paper 8102, p 103-108, May 1971. 2 ref.

Descriptors: *Mapping, *Maps, *Mississippi River, *Mississippi River basin, Surveys, Photogrammetry, Topography, Aerial photography.

The 1957 conference between Geological Survey and Mississippi River Commission officials designated the Geological Survey as the responsible agency for Mississippi Valley mapping. The Mississippi River Commission's annual mapping requirements are assumed by the Geological Survey as part of the regular mapping program. Series conversion materials are supplied to the Mississippi River Commission to enable them to produce 15-minute maps at a 1:62,500 scale. Control requirements for mapping and methods for establishing control are presented. The exchange of data and information between the two agencies expedites the systematic mapping of the Mississippi Valley. Recent developments in instruments and procedures have increased both map production and quality. (Knapp-USGS)
W71-11986

CHANNEL RECTIFICATION ENGINEERING SURVEY PROGRAM,
Corps of Engineers, Little Rock, Ark. Surveys Section.
J. M. Shields.
ASCE Proceedings, Journal of the Surveying and Mapping Division, Vol 97, No SU-1, Paper 8119, p 61-68, May 1971. 10 fig, 2 ref.

Descriptors: *Mapping, *Maps, *Survey, Hydrography, Channel improvement, Flood protection, Water resources development, Navigation, Canals, Aerial photography.

Accurate surveys and adequate maps are essential for planning, design, and construction of channel rectification and other works for a major river project. To insure the completed project it is necessary to safely perform functions intended in design and purpose. A complete analysis of the approach to the project survey and mapping requirements is necessary. Priorities for areas or data must be established. Effective plans must be made for such items as aerial photographic scales, flight direction, type of camera, location, refinement and density of ground surveys, map scales and contour intervals, logistics, and numerous other items. After these decisions are made, effective plans are accomplished for the preliminary survey and mapping for engineering and design, construction survey, and post-construction survey. Without proper planning for all phases of a project, including the use of modern techniques and high accuracy standards in surveying and mapping, costly delays are likely to occur. (Knapp-USGS)
W71-11987

THE SEASONAL INCIDENCE OF RAINFALL,
University Coll., London (England). Dept. of Geography.
For primary bibliographic entry see Field 02B.
W71-12099

08. ENGINEERING WORKS

8A. Structures

DESIGN CHARTS FOR CATCH BASIN OPENINGS AS DETERMINED BY EXPERIMENTAL HYDRAULIC MODEL STUDIES,
Los Angeles Bureau of Engineering, Calif.
Tyall A. Pardee.
City of Los Angeles Bureau of Engineering, Los Angeles, California, 1965. 105 p, 70 fig.

Descriptors: *Intakes, *Model studies, *Hydraulic models, *Storm drains, *Drainage systems, Sewers,

Surface runoff, Storm runoff, Orifices, Drainage engineering, Drainage systems.
Identifiers: *Catch basins, Catch basin openings, Storm sewers.

Experimental hydraulic model studies of a new type of catch basin have resulted in the development of the design curves in this manual. A new type of catch basin opening or inlet was also investigated. The new opening is referred to as the X-5 type and charts are included giving the hydraulic characteristics thereof for various slopes. A similar set of charts reflects the hydraulic characteristics of openings applicable to catch basins with local depressions. These charts may be used as guides to determining the capacity of existing curb openings and catch basins of this type. Both sets of charts were developed from tests made on street slopes of 0.00, 0.002, 0.005, 0.02, and 0.05. A sample problem and solution applicable to the design charts prepared for the new type of opening has been included for the benefit of the designer. Additional data are considered necessary to supplement that acquired to date. (Poertner)
W71-11804

ESTUARINES, BAYS, AND COASTAL CURRENTS AROUND PUERTO RICO,
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
Ernesto F. Colon.
Available from the National Technical Information Service as PB-202 421, $3.00 in paper copy, $0.95 in microfiche. Completion Report No. 4, UPRICO-WRRI-PR-71-31-4, Jun 1971. 41 p. OWRR Project A-031-PR (5).

Descriptors: *Currents (water), *Coasts, *Ocean currents, *Bays, Estuaries, *Puerto Rico, Current meters, Data collections.

Three model 502 In-situ Current direction, temperature, and velocity meters, were used simultaneously in a triangular pattern or in line. In some cases, all three instruments were used vertically at different depths. A one half moon cycle period was taken for each station and a continuous recording was obtained for all three measurements. This Data are shown by fectors every 10 degrees on a magnetic rose and in tabular form indicating the relative volume of water passing through the station every 10 degrees during the entire study period.
W71-11866

THERMAL EFFECTS AND NUCLEAR POWER STATIONS IN THE U.S.A.,
Argonne National Lab., Ill. Center for Environmental Studies; and Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 05C.
W71-11881

8B. Hydraulics

STATISTICAL PROPERTIES OF DUNE PROFILES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02J.
W71-11774

CHANGES IN CHANNEL PATTERN AND SINUOSITY OF THE KANSAS RIVER--CAUSE AND EFFECT RELATIONSHIP OR RANDOM PROCESS,
Kansas Univ., Lawrence. Dept. of Geography.
John R. Ratzlaff.
Kansas University Water Resources Research Institute Report, 1971. 51 p, 7 fig, 2 plate, 9 tab, 53 ref, append. OWRR Project A-025-KAN (2).

Descriptors: *Channel morphology, *Kansas, *Meanders, Discharge (Water), Sediment load, Sediment transport, Geomorphology, Correlation analysis, Streamflow, Data collections, Hydrologic data, Erosion, Sedimentation.
Identifiers: *Kansas River.

Changes in stream morphology can be deterministic (alterations of variables within the physical system by climatic or cultural influences and effects) or probabilistic (random processes). It may be difficult or impossible to isolate and identify specific cause and effect relationships. Data for channel pattern and stream discharge, which constitute an empirically-derived functional relationship, best meet the requirements. Stream discharge, through its association with precipitation, was investigated for the Kansas River on a time scale of several decades. Annual discharge before these measurements were recorded was estimated indirectly from annual precipitation computed as a representative figure for the entire drainage basin. Settlement and cultivation accelerated erosion and resulted in increased sediment loads. Comparison of maps dating from 1856 to recent aerial photographs reveals substantial channel shortening in particular reaches. This has resulted in relatively large decreases in sinuosity in these reaches and an overall decrease in sinuosity for the entire length of channel in the study area. (Knapp-USGS)
W71-11777

MINIMUM SERVICE STANDARDS,
East Bay Municipal Utility District, Oakland, Calif.
Owen F. Eide.
Ninety-first Annual Conference, American Water Works Association, Denver, Colorado, June 13-18, 1971. 17 p, 2 fig, 2 tab, 9 ref.

Descriptors: *Flow, *Water pressure, *Planning, *Administration, Water demand, Water distribution, Water rates, Conduits, Instrumentation, Head loss, Plumbing, Municipal water, California.
Identifiers: *Minimum water pressures, Residual pressure, Oakland (Calif).

The paper describes the process by which East Bay Municipal Utility District solved some of the problems related to minimum service water pressure standards. After reviewing a number of hydraulic tests made over a period of several years, it was decided that at 15 gpm the head losses from the water main to the discharge side of the meter could be kept at 5 psi. This would allow the customer a 10 psi loss through the plumbing to the fixture and still retain 15 psi residual pressure at worst. Every customer served by a minimum size service could expect 15 gpm at 25 psi on his side of the meter during use. The goal of limiting losses to 5 psi in minimum pressure areas could be met within economic limits by using a 3/4-inch meter, installing the standard 1 inch lateral; or, if the length was excessive, a 1-1/2 inch lateral. No consideration was given to installing 3/4 inch meters exclusively. They are used in low pressure areas to deliver a peak demand rate already obtained in the high pressure areas with the smaller meter. A public education program on the benefits of an adequately designed house plumbing system was inaugurated. (Poertner)
W71-11798

STORM SURGE ON THE OPEN COAST: FUNDAMENTALS AND SIMPLIFIED PREDICTION,
Coastal Engineering Research Center, Wash. D.C.
For primary bibliographic entry see Field 02L.
W71-11874

CHANNEL RECTIFICATION ENGINEERING SURVEY PROGRAM,
Corps of Engineers, Little Rock, Ark. Surveys Section.
For primary bibliographic entry see Field 07C.
W71-11987

THE HYDRAULICS OF AN AUTOMATED FURROW IRRIGATION SYSTEM WITH RECTANGULAR SIDE WEIR OUTLETS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W71-12105

8C. Hydraulic Machinery

ECONOMICS OF THE GEYERS GEOTHERMAL FIELD, CALIFORNIA,
Thermal Power Co., San Francisco, Calif.
D. A. McMillan, Jr.
Paper, U N Symposium, Pisa, 1970. 17 p, 1 fig, 5 tab, 56 ref.

Descriptors: *Geothermal powerplants, Geothermal studies, *Thermal powerplants, *Electric powerplants, Pipelines, Wells, Steam, Costs, *Turbogenerators, Electric power, Electric power production, *Electric power costs, California, Corrosion, Bibliographies.
Identifiers: Geothermal investigations, Geothermal resources, Geysers (Calif).

The Geysers field in Calif., the greatest known geothermal field in the world, is proof that geothermal energy is a considerable natural resource and an economical, dependable source of electric energy. The cost of electric energy produced at The Geysers is lower than $0.005/kwh, including the actual price of the steam at $0.0026/kwh. The average cost of conventional thermal and atomic electrical power in California is $0.007/kwh. Recently, wells in The Geysers field have been drilled to an average depth of 5,000-8,000 ft at an average cost of $150,000/well. Static pressure of the wells is 500 psig with bottom hole temperatures of 500 deg F. The steam transmission system is designed for a pressure of 180 psig. The longest pipeline length to the plant is 2,000 ft. Pipelines are designed for an average pressure drop of 6 psi and temperature losses of only 1 to 2 deg F between well heads and plants. Plant design is based on the use of 20 lb of steam/kwh. The capacity of the proven geothermal field is presently evaluzted at 2,500 mw. Corrosion, incrustation, and waste water disposal problems are under control at The Geysers field. The plant is designed for unattended operation. Two men are on duty for 8 hr/day. (USBR)
W71-11650

VIBRATION ANALYSIS OF PUMP DISCHARGE LINES,
California State Dept. of Water Resources, Sacramento.
Jesse M. Diaz and Ravinder K. Jain.
ASCE Journal of the Hydraulics Division, Vol 96, No HY-11, p 2279-2296, Nov 1970. 7 fig, 7 ref.

Descriptors: *Pumps, *Discharge lines, *Vibrations, Resonance, Mathematical studies.

The causes of vibrations in pump discharge lines are analyzed, and graphs that can be used to determine critical stiffener spaces to avoid resonance are presented. These graphs utilize the parameters of fR versus L/R for the various pressures and h/R ratios. (Where f equals the natural frequency of the pipe, R equals the radius of the shell in inches, L equals the longitudinal wave length, and h equals the thickness of shell in inches.) It is noted that the vibrations also can be eliminated by modifying the characteristics of the pump. However, use of stiffeners is normally the most convenient method. (Mortland-Battelle)
W71-11719

GEOTHERMAL EXPLORATION IN THE WESTERN UNITED STATES,
California Division of Mines and Geology, San Francisco.
For primary bibliographic entry see Field 02F.
W71-11812

CURRENT STATUS OF GEOTHERMAL POWER PLANTS AT THE GEYSERS, SONOMA COUNTY, CALIFORNIA, U S A,
Pacific Gas and Electric Co., San Francisco, Calif.
D. B. Barton.

Paper, U N Symposium, Pisa, 1970. 13 p, 4 fig.

Descriptors: *Geothermal powerplants, Geothermal studies, Powerplants, *Thermal powerplants, *Electric powerplants, Pipelines, Wells, *Electric power production, Steam, Electric power, *Turbogenerators, California, Corrosion, Drilling, Injection wells, Brine disposal.
Identifiers: Geothermal investigations, Geothermal resources, Geysers (Calif).

Electric power in commercial quantities from geothermal steam has been produced at The Geysers, Calif, since 1960. Four steam turbine-generators have been installed with a total production capacity of 82,000 kw. Two more units of 55,000-kw capacity each are under construction and more units are planned. Fifty-two wells have been drilled, greatly enlarging the known boundaries of the steam field. Actually, the boundaries of the field have not been clearly determined. Several step-out wells some distance from the production areas have been successful. The existing turbine-generators take steam at 350 deg F and 80 or 65 psig pressure. The new units will use steam at 100 psig pressure. The steam flow is greater than the cooling tower evaporation, and the excess water contaminated with ammonia, sulfides, and boron presents a disposal problem; injection wells are being used for disposal. The steam supply is slightly superheated and contains ammonia, carbon dioxide, and hydrogen sulfide. These present corrosion problems to plant equipment, but proper selection of materials has reduced corrosion to acceptable limits. The 4 existing units are designed to run at constant load unattended. Operating personnel are normally present during daytime only. (USBR)
W71-11813

NEW TRENDS IN THE PLANNING AND DESIGN OF GEOTHERMAL POWER PLANT,
Ente Nazionale per l'Energia Eletrrica, Florence (Italy). Compartimento di Firenze.
R. Corti, P. D. Mario, and F. Mondolfi.
Paper, U N Symposium, Pisa, 1970. 21 p, 11 fig, 9 ref.

Descriptors: *Geothermal powerplants, Geothermal studies, *Thermal powerplants, *Electric powerplants, Drilling, Pipelines, Temperature, Wells, Steam, Steam turbines, Condensers (Liquefiers), Compressors, *Turbogenerators, Powerplants, Electric power, Thermal energy, Thermal power, *Electric power production, Foreign research.
Identifiers: Geothermal investigations, *Geothermal resources, Italy.

The amount of endogenic fluid that can be extracted from a developed geothermal area is restricted and will diminish in time, although at a slow rate. To compensate for this decrease and to improve productivity, the area must be expanded by drilling at progressively more distant sites. Almost invariably, the characteristics of the steam jets in these areas are remarkably different from those at the existing site, and slowly evolve before becoming stabilized. For this reason, design of geothermal powerplants in Italy has been modified to provide adaptability to these changing conditions. Decentralization is planned to provide installation almost at the well-head of small-capacity productive jets capable of remote control from a few pilot power stations. The turbogenerators used are capable of exhausting to the atmosphere, have extremely elastic intake characteristics, and are simple and compact to facilitate transfer and operational control. Condensation turbogenerator compressor units permit raising the thermal level of the hot spring at intake and, where appropriate, ensure adaptation of the thermal level of the cold spring of the cycle to the characteristics of the endogenic fluid to obtain optimum use of the wells-power station complex. (USBR)
W71-11815

PERFORMANCE CHARACTERISTICS OF ADVANCED EVAPORATOR TUBES FOR LONG-TUBE VERTICAL EVAPORATORS,
Oak Ridge National Lab., Tenn. Nuclear Desalination program.
For primary bibliographic entry see Field 03A.
W71-11871

8D. Soil Mechanics

STRAINS AND STRESSES IN EARTH AND ROCKFILL DAMS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Moscow (USSR).
A. A. Nitchiporovitch, and A. P. Sinitsyn.
Proceedings, 7th International Conference on Soil Mechanics and Foundations Engineering, p 335-343, Mexico, 1969. 9 p, 9 fig, 1 tab, 13 ref.

Descriptors: *Stress, *Strain, Dams, *Earth dams, *Rockfill dams, Dead loads, Dynamic loads, Design criteria, Research and development, Foreign research, *Seismic design, Seismic waves, Hydrostatic pressure, Elastic theory, Elastic limit, Creep, Equations, Reservoirs, Settlement (Structural).
Identifiers: USSR, Nonlinear properties.

The first part of this paper presents results of studies of stresses and strains in earth and rockfill dams under static loads. The Vodgeo Institute developed methods to estimate the vertical deformations in rockfill shells of detritus material during the construction period and during the life of the structure. Large specimens were tested under high pressures, and elastic-plastic and creep strains were studied. Methods of strain calculation were proposed and, subsequently, field tested. The second part of the paper deals with the results of current research and selection of design criteria for aseismic structures. A method for determining dynamic loads on the principles of wave theory is presented. The influence of horizontal and vertical displacements and cross-sectional rotation are taken into account. The application of this method to designing large dams was made possible by means of a special model in which the dam is considered as a system with many degrees of freedom. (USBR)
W71-11811

PREWETTING OF LOESS-SOIL FOUNDATION FOR HYDRAULIC STRUCTURES,
Academia R.P.R., Bucharest.
A. A. Beles, I. I. Stanculescu, and V. R. Schally.
Proceedings, 7th International Conference on Soil Mechanics and Foundations Engineering, p 17-25, Mexico, 1969. 9 p, 11 fig, 10 ref.

Descriptors: *Ponding, *Loess, Soils, Soil moisture, Reservoirs, Soil mechanics, *Soil density, Soil stabilization, *Settlement (Structural), Consolidation, Hydraulic structures, Tanks (Containers), Infiltration, Saturation, Foreign construction, Porosity, Deformation, Void ratio, Foundations.
Identifiers: *Prewetting, Specific volume.

Prewetting of loess-soil foundations by ponding for hydraulic structures whose foundations are thoroughly wetted is highly desirable. The natural low-density earth material is subject to significant subsidence (even under its own weight) when saturated. The method was first used in Roumania as a solution to foundation problems encountered in the construction of radial settling tanks and water reservoirs. Geotechnical peculiarities of the structure sites and a description of the structures are given. The efficiency and economy of the method are supported by data. Information regarding the satisfactory behavior of the structures attests to the applicability of the prewetting method as a means of avoiding uneven settlement of low density loess-soil foundations. (USBR)
W71-11814

STABILITY OF LOW EMBANKMENT ON COHESIVE SOIL STRATUM,
Ministry of Transportation, Yokosuka (Japan). Port and Harbour Research Inst.
A. Nakase.
Soils Foundation, Vol 10, No 4, p 39-64, Dec 1970. 26 p, 25 fig, 10 ref.

Descriptors: *Slope stability, Slip surface, Slopes, Safety factors, Slip-circle method, *Stability analysis, *Embankments, Soil mechanics, Earth dams, Foreign design practices, Stability, *Charts, Graphical analysis, Cohesive soils, Bearing capacity.
Identifiers: Japan.

Stability of low embankments with arbitrary surcharge is examined by assuming that the phi — 0 method of analysis is applicable and that the undrained shear strength increases linearly with depth. A vertical tension crack is assumed to develop in the fill above the point at which the slip surface emerges from the foundation soil. A stability chart is compiled from the results of the analysis. For cases where the thickness of the cohesive soil stratum is limited, stability is analyzed by assuming circular and plane slip surfaces, and a stability chart is compiled. A stability chart for embankments with a vertical face is compiled to make rough estimates of stability of structures such as sheet pile bulkheads. The graphical procedures presented are simple to perform, and produce satisfactory accuracy when applied to low embankments with simple side slopes. Slopes with complicated load intensity can be replaced by an equivalent simple slope or by a combination of simple slope and surcharge. The basic assumption of the analysis is development of a vertical tension crack through the embankment, and can only be applied safely to problems where the height of embankment is small compared to the length of the slip surface in the foundation. (USBR)
W71-11816

EMBANKMENT DRAINAGE AFTER INSTANTANEOUS DRAWDOWN,
Waterloo Univ. (Ontario).
For primary bibliographic entry see Field 04A.
W71-11817

PREDICTION OF PORE PRESSURES IN EARTH DAMS,
Commonwealth Scientific and Industrial Research Organization, Syndal (Australia).
B. G. Richards, and C. Y. Chan.
Proceedings, 7th International Conference on Soil Mechanics and Foundations Engineering, p 355-362, Mexico, 1969. 8 p, 10 fig, 1 tab, 17 ref.

Descriptors: *Pore pressure, *Earth dams, Forecasting, Soil mechanics, Pressure distribution, Transient flow, Saturated flow, Unsaturated flow, Uplift pressure, Negative pore pressure, Foreign research, Mathematical analysis, Boundary conditions, *Computer applications, Bibliographies, Dam design, *Computer programs, Analytical techniques.
Identifiers: Australia, Flagstaff Gully Dam (Tasmania).

The performance of earch dams depends largely on the transient moisture flow and the resulting pore pressure distribution within and under the embankment. The development of a computer program for calculating changes in positive and negative pore pressures in earch dams is described. The method involves solving the simple 2-dimensional flow equation for isothermal liquid phase transfer of moisture in saturated and partially saturated soils. The program has been applied to the clay core of the Flagstaff Gully Dam, Tasmania, in which positive pore pressure readings have been obtained from Casagrande-type piezometers since it was refilled following a catastrophic piping failure. The agreement between predicted and observed positive pore pressures was remarkably good; negative pore pressures measured in the laboratory on samples taken from the core were not in such good

agreement with predicted values, but did show the same relative trends. (USBR)
W71-11818

CONSISTENCY OF DECOMPOSED GRANITE SOILS AND ITS RELATION TO ENGINEERING PROPERTIES,
Kyoto Imperial Univ. (Japan); and Osaka Inst. of Tech. (Japan); and Kansai Univ., Osaka (Japan).
S. I. Matsuo, M. Fukuta, and K. Nishida.
Soils Foundations, Vol 10, No 4, p 1-9, Dec 1970. 9 p, 12 fig, 1 tab, 4 ref.

Descriptors: *Consistency, Granite, Soil engineering, Soil mechanics, Soil investigations, Soil plasticity, *Soil properties, *Soil tests, *Slump, Permeability, Soils, Foreign research.
Identifiers: Japan.

For decomposed granite soils containing significant amounts of coarse grains, determining the consistency by standard Atterberg tests is difficult or almost impossible. A new method for measuring the consistency of relatively coarse soils is based on the slump test ordinarily used for concrete. A study of the consistency of decomposed granite soils using the new method shows that the weathering and mineral composition which play a significant role in the classification of the decomposed granite soils can be well represented by the consistency according to this method, and that the consistency is closely related to engineering properties such as compaction and permeability. Consistency defined by the slump test can be used as a simple means for determining the engineering properties of decomposed granite soils. (USBR)
W71-11819

PORE SIZE DISTRIBUTION STUDIES,
Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering.
For primary bibliographic entry see Field 02G
W71-11985

8F. Concrete

INTEGRATED SYSTEM FOR RC BUILDING DESIGN,
Massachusetts Inst. of Tech., Cambridge.
J. M. Briggs, P. J. Pahl, and H. N. Wenke.
Proceedings, American Society of Civil Engineers, Journal of the Structural Division, Vol 97, No ST1, p 13-31, Jan 1971. 19 p, 9 fig, 5 ref, append.

Descriptors: Buildings, *Building design, Structural design, *Concrete structures, Structural engineering, Reinforced concrete, Frames, Design, Computer applications, Computer programs, Structural analysis, *Computer systems programs, Structural members.
Identifiers: Computer-based systems.

A computer system that permits the analysis and design of complete reinforced concrete buildings of various types is described. Any geometric configurations or loadings may be handled, but a simplified form of input is used for typical orthogonal buildings. Various methods of analysis are provided, ranging from approximate analysis of a portion of the building to a complete, 3-dimensional stiffness analysis of the entire structure. Critical live load positions and code-specified load combinations may be generated automatically. The member design capabilities include beams and columns of various shapes, flat slabs, and one-way floor systems. Such members are designed in complete detail, including primary and secondary reinforcement and the location and length of all bars. Member design may be controlled by prespecifying cross-section dimensions or steel percentages and by specifying geometric similarities or identities between members. Recycling of analysis and design, during which member properties and dead weights are updated, is possible in one computer run. Final output consists of member schedules, reinforcement details, and quantities. (USBR)
W71-11810

8I. Fisheries Engineering

AN ESTIMATION OF THE MINIMUM LEVEL OF DISSOLVED OXYGEN IN WATER REQUIRED FOR NORMAL LIFE OF FISH,
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 05C.
W71-12088

AQUACULTURE AND THE LAW,
Miami Univ., Coral Gables, Fla. School of Law.
For primary bibliographic entry see Field 06E.
W71-12148

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

PUBLICATION RELATED TO WATER RESOURCES RESEARCH CENTER PROJECTS 1965-71 ABSTRACT-INDEX.
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 10.
W71-11730

9C. Research Facilities

DIRECTORY OF HYDRAULIC RESEARCH INSTITUTES AND LABORATORIES.
International Association for Hydraulic Research, Delft (Netherlands).
For primary bibliographic entry see Field 02A.
W71-12018

9D. Grants, Contracts, and Research Act Allotments

PUBLICATION RELATED TO WATER RESOURCES RESEARCH CENTER PROJECTS 1965-71 ABSTRACT-INDEX.
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 10.
W71-11730

10. SCIENTIFIC AND TECHNICAL INFORMATION

PUBLICATION RELATED TO WATER RESOURCES RESEARCH CENTER PROJECTS 1965-71 ABSTRACT-INDEX.
Minnesota Univ., Minneapolis. Water Resources Research Center.

Available from the National Technical Information Service as PB-202 348, $3.00 in paper copy, $0.95 in microfiche. Minnesota Water Resources Research Center Bulletin 32, May 1971. 59 p. OWRR Project A-999-MINN (16).

Descriptors: *Bibliographies, *Abstracts, *Publications, *Water Resources Research Act, *Minnesota, Universities, Grants, Water resources, Water resources development, Hydrology, Hydrogeology, Limnology, Eutrophication, Water quality, Ecology, Water balance, Hydrologic cycle.
Identifiers: *University of Minnesota, *Water resources research.

During the period 1965-71, the Water Resources Research Center, University of Minnesota through the Office of Water Resources Research, U.S. Department of the Interior has funded 38 research projects. Fifty-four technical reports, papers and theses have been published describing the results of these research projects. Information concerning the 54 publications related to Center research projects conducted during the period 1965-71 are summarized in this Bulletin. Data on Project Number, Project Title, Principal Investigator, Period of Investigation, FCST Research Category, Publication Short Title, Publication Abstract, Publication Authors, Publication Title, Publication Source, Publication Corporate Authors, Publication Descriptors, Publication Identifiers, and Publication Availability are presented. (Knapp-USGS)
W71-11730

EROSION AND SEDIMENTATION,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 02J.
W71-11740

WASTE DISPOSAL AND TREATMENT IN PERMAFROST AREAS - A BIBLIOGRAPHY.
Department of Interior, Washington, D.C. Office of Library Services.

Department of Interior, Office of Library Services Bibliography Series 22, March 1971. 28 p, 172 ref.

Descriptors: *Bibliographies, *Cold regions, *Permafrost, *Waste disposal, *Waste treatment, Sewage treatment, Sewage disposal, Waste water treatment, Ultimate disposal, Water pollution control, Environment.
Identifiers: *Waste disposal (Permafrost areas).

With the increased activity in far northern regions, there must be adequate waste disposal systems in order to provide for a healthful and aesthetically acceptable environment in areas with permafrost and discontinuous permafrost. Material collected dates from 1940 through 1969. While the emphasis is on English language literature, a number of foreign language publications have been included. The bibliography is arranged according to the following broad categories: (1) practice, problems, needs; (2) collection, transport, disposal; (3) thermology, construction, operation; (4) biological process; and (5) physical treatment, processing, reuse. (Knapp-USGS)
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SOIL POLLUTION: EROSION EFFECTS IN SOIL.
Defense Documentation Center, Alexandria, Va.
For primary bibliographic entry see Field 05B.
W71-11873

DIRECTORY OF HYDRAULIC RESEARCH INSTITUTES AND LABORATORIES.
International Association for Hydraulic Research, Delft (Netherlands).
For primary bibliographic entry see Field 02A.
W71-12018

ARSENIC AND LEAD IN WATER - A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05B.
W71-12036

THE EFFECT OF CARBON ON ALGAL GROWTH--ITS RELATIONSHIP TO EUTROPHICATION,
Utah State Univ., Logan. Utah Water Research Lab.
For primary bibliographic entry see Field 05C.
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Research Institute of Rutgers University.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the EPA-Water Quality Office, Soap and Detergent Association, and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Textile wastes pollution at the School of Textiles of North Carolina State University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Water Quality Office of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association Research Foundation.

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- NATURE OF WATER
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- WATER SUPPLY AUGMENTATION AND CONSERVATION
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